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A

CONCISE SYSTEM OF ARITHMETIC,

Peculiarly adapted to the uſe of Schools,

IN TWO PARTS.

Part I. contains—*The ſeveral Rules, with a variety of Examples under each.*

Part II. contains—*Anſwers to the Examples in* Part I. *together with the principal ſteps of the more tedious operations.*

The former is deſigned as a Text-book for the uſe of the Scholar,—the latter is intended for the eaſe and convenience of the Teacher; and both together will furniſh private Students with an uſeful companion.

BY A. MELROSE,
TEACHER, EDINBURGH.

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THE utility of Text-books is ſo obvious, that they are uſed in every department of Education. Their aſſiſtance is, perhaps, as neceſſary in teaching Arithmetic as in any other branch of ſcience. A Teacher, who has the care of a numerous School, however great his abilities, will find it difficult to lead forward his pupils, with eaſe and propriety, without their aid. Nor will they be found of leſs advantage to the Scholar—each having one of his own, he has thereby an opportunity, when out of ſchool, to commit any rule to memory, or perform any taſk his Teacher may aſſign him. With this view the preſent work is humbly offered.—The firſt part containing ſuch a variety of Exerciſes as will enable the Teacher to give different queſtions to different pupils. The ſecond part furniſhing conſiderable aſſiſtance in their ſolution.——A low priced book on this plan, in the Author's opinion, was wanted; how far the preſent attempt is calculated to ſupply that defect, the public will determine.

MVSEVM
BRITAN
NICVM

MULTIPLICATION TABLE.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

TABLES.

Engliſh money. 4 farthings = 1 penny, 12 pence = 1 ſhilling, 20 ſhillings = 1 pound.

Note, $\frac{1}{4}$ ſignifies 1 farthing, $\frac{1}{2}$ 1 halfpenny, $\frac{3}{4}$ three farthings; alſo, a guinea = 21s, a crown = 5s, jacobus = 25s, moidore = 27s, joannes = 36s, angel = 10s, mark = 13s 4d, noble = 6s 8d.

2. *Avoirdupoiſe weight.* 16 drams or dr. = 1 oz. 16 oz. = 1 pound, 28 lb. = 1 quarter, 4 qrs = 1 hundredweight, 20 cwt = 1 ton.

This weight is uſed for almoſt every thing in England, and in Scotland for leather, tallow, ſoap, groceries, *&c.*; and all goods brought from England.

3. *Troy weight.* 24 grains, or gr. = 1 pennyweight, 20 dwt = 1 ounce, 12 oz. = 1 lb. This weight is uſed for gold, ſilver, jewels, bread, *&c.*

4. *Apothecaries weight.* 20 gr. = 1 ſcruple, 3 ſcr. = 1 dram, 8 dr. = 1 oz. = 12 oz. 1 lb.

5. *Cloth meaſure.* $2\frac{1}{4}$ inches = 1 nail, 4 nails = 1 qr, 4 qrs = 1 yard, 3 qrs = 1 ell Flemiſh, 5 qrs = 1 ell Engliſh, 6 qrs = 1 ell French, $37\frac{1}{5}$ in. = 1 ell Scotch.

6. *Long or lineal meaſure.* 3 barley-corns = 1 inch, 12 in. = 1 foot, 3 feet = 1 yard, $5\frac{1}{2}$ yds = 1 pole, perch or rod, 40 poles = 1 furlong, 8 fur. or 1760 yds = 1 mile, 3 m. = 1 league.

7. *Square meaſure.* 144 inches = 1 foot, 9 feet = 1 yd, &c.
Solid meaſure. 1728 inches = 1 foot, 27 feet = 1 yd, &c.
Land meaſure, Engliſh. $30\frac{1}{4}$ yds = 1 pole, 40 poles = 1

rood, 4 roods = 1 acre. *Land meaſure, Scotch.* 36 ells = 1 fall, 40 falls = 1 rood, 4 roods = 1 acre. Alſo, 100 links = 1 gunter's chain, 10000 links = 1 ſquare chain, 100000 links or 10 chains = 1 acre. The Engliſh chain = 66 feet, the Scotch chain = 74 feet.

8. *Wine meaſure.* 231 ſolid inches = 1 gallon. 2 pints = 1 quart, 4 qts = 1 gallon, 10 gal. = 1 anker, 18 gal. = 1 runlet, $2\frac{1}{3}$ runlet or 42 gal. = 1 tierce, 2 tierce or 84 gal. = 1 puncheon, $31\frac{1}{2}$ gal. = 1 barrel, 2 bar. or 63 gal. = 1 hogſhead, 2 hhds = 1 pipe, 2 pipes = 1 ton.

Ale and beer meaſure. 282 ſolid inches = 1 gal. 2 pints = 1 quart, 4 qts = 1 gal. 8 gal. ale and 9 beer = 1 firkin, 2 firkins = 1 kilderkin, 2 kilderkin = 1 bar. $1\frac{1}{2}$ barrel = 1 hogſhead.

Dry meaſure. 2 pints = 1 quart, 4 qts = 1 gallon 2 gal. = 1 peck, 4 pecks = 1 buſhel, 8 buſhels = 1 quarter.

Time. 60 thirds = 1 ſecond, 60 ſec. = 1 minute, 60 min. = 1 hour, 24 hours = 1 day, 365 days = 1 year, 365 days 6 hours = 1 julian year, 365 days 5 hours 48 min. 57 ſec. = 1 ſolar year.

Note, *That in the ſubſequent work, the following diviſion (though not ſo accurate as the above) is ſometimes uſed; 30 days = 1 month, 12 months = 1 year; 7 days = 1 week, 4 weeks = 1 month, 52 weeks = 1 year.*

Scots troy, or Dutch weight. 16 drops = 1 oz. 16 oz. = 1 lb. 16 lb. = 1 ſtone.

Trone weight is the ſame as the above, only the pound varies in different places and for different purpoſes, from 20 to 28 ounce.

Scotch dry meaſure. 4 lippies = 1 peck, 4 pecks = 1 firlot, 4 fir. = 1 boll, 16 = bolls 1 chalder.

Scotch liquid meaſure. 4 gills = 1 mutchkin, 2 mutch. = 1 choppin, 2 chop. = 1 pint, 2 pints = 1 quart, 4 qts = 1 gal.

Algebraic Characters.

+, *plus*, the ſign of addition. —, *minus*, the ſign of ſubtraction. ×, ſign of multiplication. ÷, ſign of diviſion. Or diviſion is ſometimes repreſented by placing the dividend above, and the diviſor below a line in the form of a vulgar fraction. :, ::, the ſign of proportion. Proportional numbers are ſtated and read as follows: 2 : 4 :: 3 : 6; that is, 2 is to 4 as 3 is to 6.

$\sqrt{}$ Square root. $\sqrt[3]{}$ Cube root.

MULTIPLICATION TABLE.

In compliance with the wiſhes of ſome, a multiplication table of the following form is alſo inſerted.

Twice
2 makes 4
3 —— 6
4 —— 8
5 —— 10
6 —— 12
7 —— 14
8 —— 16
9 —— 18

Three times
3 makes 9
4 —— 12
5 —— 15
6 —— 18
7 —— 21
8 —— 24
9 —— 27

Four times
4 makes 16
5 —— 20
6 —— 24
7 —— 28
8 —— 32
9 —— 36

Five times
5 makes 25
6 —— 30
7 —— 35
8 —— 40
9 —— 45

Six times
6 makes 36
7 —— 42
8 —— 48
9 —— 54

Seven times
7 makes 49
8 —— 56
9 —— 63

Eight times
8 makes 64
9 —— 72

Nine times
9 —— 81

Ten times
2 makes 20
3 —— 30
4 —— 40
5 —— 50
6 —— 60
7 —— 70
8 —— 80
9 —— 90
10 —— 100

Eleven times
2 makes 22
3 —— 33
4 —— 44
5 —— 55
6 —— 66
7 —— 77
8 —— 88
9 —— 99
10 —— 110
11 —— 121

Twelve times
2 makes 24
3 —— 36
4 —— 48
5 —— 60
6 —— 72
7 —— 84
8 —— 96
9 —— 108
10 —— 120
11 —— 132
12 —— 144

PENCE TABLES.

d.		*s.*	*d.*	*s.*		*d.*	*s.*		*l.*	*s.*
20	=	1	8	2	=	24	20	=	1	—
30	=	2	6	3	=	36	30	=	1	10
40	=	3	4	4	=	48	40	=	2	—
50	=	4	2	5	=	60	50	=	2	10
60	=	5	—	6	=	72	60	=	3	—
70	=	5	10	7	=	84	70	=	3	10
80	=	6	8	8	=	96	80	=	4	—
90	=	7	6	9	=	108	90	=	4	10
100	=	8	4	10	=	120	100	=	5	—
110	=	9	2	11	=	132	110	=	5	10
120	=	10	—	12	=	144	120	=	6	—

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ARITHMETIC.

ARITHMETIC is the ſcience which treats of the properties of numbers, and the method of computing by them. Its fundamental rules are Notation, Numeration, Addition, Subtraction, Multiplication, and Diviſion: The four laſt may be diſtinguiſhed into ſimple and compound, according as the numbers concerned are of the ſame or of different names.

NOTATION.

Notation teaches to expreſs numbers by figures.

The Figures are the ten following:

1,	2,	3,	4,	5,	6,	7,	8,	9,	0.
One,	two,	three,	four,	five,	ſix,	ſeven,	eight,	nine,	cypher.

Theſe may repreſent either Units, Tens, Hundreds, *&c.* according to the place in which they ſtand, as in the following Table:

Quintillions.	c	x	t	c	x	Quadrillions.	c	x	t	c	x	Trillions.	c	x	t	c	x	Billions.	c	x	t	c	x	Millions.	Hunds of Thouſ.	Tens of Thouſ.	Thouſands.	Hundreds.	Tens.	Units.
8.	0	7	4,	7	3	8.	5	7	7,	4	8	3.	8	9	0,	0	6	4.	8	7	1,	8	3	4.	7	1	4,	8	9	8

Where it appears 1*ſt*, that any figure ſtanding in the firſt place repreſents ſo many Units, in the ſecond ſo many Tens, *&c.* continually increaſing in a tenfold proportion towards the left hand. 2*dly*, That though the cypher is quite inſignificant when ſtanding by itſelf, or on the left hand of any number; yet, placed on the right hand of any of the other figures, it increaſes their value ten times. Whence this

Rule, To write down any number in figures—Put the figures of the number in the *places* mentioned in it, and ſupply vacancies with cyphers.

EXAMPLES.

Write down in figures, four hundred and thirty-two—ſix hundred and ſeven—ſeven hundred and ninety—four thouſand ſeven hundred and twenty—fifty eight thouſand and eight—one hundred thouſand four hundred and four—ſeventy million—three hundred and thirty three million four thouſand and four—nine billions—twenty-four trillions—three quadrillions—four quintillions—ſeven ſextillions—three ſeptillions—five octillions—two nonillions.

NUMERATION

Teaches to read any number expreſſed in figures.

Rule, Diſtinguiſh the number into periods, of ſix figures each, as in the Table, whereby the *places* of the ſeveral figures will readily appear; read them accordingly.

EXAMPLES.

Write in words, 7846—9107—834168—10000—9141600 716800078—87141687001—8914168784141—801714678

ADDITION

Teaches to find a number equal to the ſum, total, or amount of two or more numbers.

SIMPLE ADDITION.

Rule, Write the given numbers under each other, ſo that units ſtand under units, tens under tens, *&c.*

Begin at the units column, find its ſum; for every ten, in that ſum, carry one to the next column; but firſt write the exceſs above the tens under the column added; proceed thus with every remaining column, till the laſt, under which write the whole ſum.

Proof. Repeat the operation, beginning at the top.

EXAMPLES.

467894	8745678	93748657	69147873914
567891	3854953	58597478	25789094856
234567	6788495	7141637	73571408741
891416	6378964	815621	2147854734
745935	5916387	7891468	87841157854
874896	4859635	714876	73874998937
487493	8749638	89419675	22534567890
4270092			

4. 91416874+9123456+7894+371869+7146785 4+98746.

5. 9141687+91474+768746+741639+456789123+74869.

6. 8914681+71416866+6714168+7891234+5678901.

7. 8345678+901234+5678912+345678912+3456789.

8. 79141687+41789143+456789+123456+789123456.

9. 9714167914+8798754+91467857+34968748+3741689 +78963874+87891468+93417348+89148638.

10. 47141689648+38987491689+714676341 68+711416387489+71416874896948 7+1469148749+8914167896.

11. 7149147 68954+37914286 6786+87141687 4+711434+ 3714628416+714689143456 7+914638+714169416941.

12. 9114007141 68+37898460918 7+8901234567+87141687689+7141687148 96+871456701234 56+78901234 56+789884462+78610234 56+89487146873 54+91416874 89 +714896784359+9141687143+7149168748.

13. A owes to B £. 8967, to C 7456, to D 7498, to E 7538, to F 78568, to G 91034, to H 9168. Required A's debt.

14. A Gentleman planted of Elms 7846, of Aſhes 7384, of Firs 7889, of Oaks 718, of Birches 389, of Beeches 898. How many did he plant in all?

15. D borrowed of C at one time £. 348, at another 754, at another 137, and 785: How much has he borrowed in all?

16. D has paid C at one time £. 934, at another 121, at another 515, and owes him ſtill 454. What was D's debt?

17. The imports of Cotton-Wool into Britain for 1789 were as follows, *viz*. From Foreign Weſt Indies *Libs*. 239803, Turkey 4668231, Eaſt Indies 2101104, Domerary 1345702, French 6143623, Brazil 4755635, Spaniſh Weſt Indies 93726, Weſt Indies per Ireland 52794, Georgias 18964, Africa 1626, Bahamas 377980, Bermudas 5800, Britiſh 9998986, other parts 705921, into Scotland, from the Britiſh Weſt Indies 1700000. Required the total imports anno 1789.

18. From the creation to the departure from Egypt was 2513 years; from thence to the building of Solomon's Temple 487; to the firſt olympiad 228; to the Jewiſh captivity 170; to their return 70; to the beginning of the Peloponeſſian war 105; to Alexander's conqueſt of Perſia 98; to the firſt Punic war 69; to the deſtruction of Carthage 118; to the Chriſtian Æra 146; to the preſent year 1790. Required the time from the creation.

19. A Farmer laid out on Oxen £. 296; on Horſes 413; on Sheep 754; on Cows 217; on Timber 87; on Iron 23; on Labouring-utenſils 173; on Houſehold-expences 33. Required his total diſburſements.

20. Received from A, ſeven hundred and ſixty-four pounds, from B. one thouſand, from C. fifty-five, from D. eight hundred and one, from E. one thouſand and ſixty-eight, from F. eleven thouſand eleven hundred and eleven, from G. ten thouſand one hundred and nine, from H. five hundred and and ſixty pounds. How much did I receive in all?

21. From Edinburgh to Perth is 41 miles, from Perth to Brechin 42 m. from Brechin to Aberdeen 39 m. from Aberdeen to Banff 44 m. from Banff to Elgin 33 m. from Elgin to Inverneſs 38 m. Required, the diſtance of each of theſe towns, from each of the others.

SUBTRACTION

Teaches to find the difference of any two numbers, by taking the leſs from the greater. The greater is called the Minuend, the leſs the Subtrahend.

Simple Subtraction.

Rule, Place the leſs number under the greater, units under units, tens under tens, *&c.* Beginning at units, take the firſt under figure from that above it, under which write the difference. Proceed thus with every remaining figure, except when an under figure exceeds its correſponding upper one, in which caſe, take the lower from ten, add the remainder to the upper figure, which ſum ſet down as before; remembering to carry one to the next under figure, for the ten borrowed.

EXAMPLES.*

Proof. The ſum of the Subtrahend & remainder, will be equal to the Minuend, if the work is right.

From	7486	Minuend.
Take	3795	Subtrahend.
	3691	Remainder.
	7486	Proof.

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* More examples may be taken from the two firſt lines of the examples in Addition.

1. A borrowed from B 6548*l.* of which he has ſince paid 1874. How much is A. ſtill due?
2. A was born anno 1739, B 1752. Req. their ages?
3. C is now 57 years of age and D 69, when were they born?
4. A owes B 8118*l.* of which he has paid 789*l.* What is yet due?
5. A gentleman has of yearly rent 3113*l.* and pays 219*l.* feu-duty; what is his nett income?
6. A gentleman, juſt now living in Yorkſhire, is aged 137 years; in what year was he born, this being anno 1790?
7. A perſon owes to A 437*l.* to B 981*l.* to C 988*l.* to D 754*l.* he has in caſh 899*l.* in bills 1000*l.* How much will he require to pay off his debt?
8. A certain building was founded *anno* 1519, another 604 years ſooner. How long is it ſince each of theſe events?
9. The Iſraelites departed from Egypt *anno mundi* 2513, and Solomon's Temple was built *a. m.* 3000. How many years elapſed between theſe events?
10. A bankrupt owed to A 436*l.* and compounded with him for 177*l.* to B 893*l.* but compounded with him for 379*l.* to C 1114*l.* but compounded for 539*l.* to D 1000*l.* but compounded for 467*l.* Required the Bankrupts total deficiency?
11. X borrowed 1781*l.* and paid 987*l.*; borrowed 1114*l.* paid 873*l.*; borrowed 891*l.*; paid at two different times 198*l.* How much does he ſtill owe?
12. What is the difference betwixt one billion and 197848615.

MULTIPLICATION

Teaches to find the amount of a number repeated as often as there are units in another: The firſt of theſe is called the multiplicand, the laſt the multiplier; and both of them are called factors. The amount of the number, ſo repeated or multiplied, is called the product.

Simple Multiplication.

Rule 1. To multiply by any number, write the multiplier under the multiplicand, units under units, tens under tens, *&c.*—Beginning at units, multiply the multiplicand by each figure of the multiplier ſucceſſively, always obſerving to place the firſt figure of each product under the figure by which you are multiplying. Add theſe products.

Note 1. *If the multiplier is 12, or under, multiply by it at once.*
2. *If there be cyphers annexed to either or both factors, multiply by the ſignificant figures, and annex the cyphers to the product. Whence, to multiply by an unit with cyphers, is only to annex the cyphers to the multiplicand.*

EXAMPLES.

Multiply 67890314286759 by 6, 7, 8, 9, 10, 11, 12.

1. 78460839×23
2. 809875465×34
3. 687496×46
4. 914749×58
5. 709635×69
6. 787496×47
7. 5789690×59
8. 9694098×68
9. 678457×74
10. 345678×85
11. 8912085×97
12. 697485×100
13. 6789456×407
14. 91468379×809
15. 831097854×8934
16. 574673889×5148
17. 7896384×305
18. 6849645×704
19. 567890015×7895
20. 4839786×6005
21. 7376870×9764
22. 84684689×6785
23. 9487096×7089
24. 6945873×9807
25. 78596439×93875
26. 7894683×57864
27. 7146874×76948
28. 6846000×478400
29. 7469400×6914000
30. 6785946×567890
31. 7146087×7080040
32. 879146×370854
33. 896385×66874
34. 378569×700000
35. 3486000×850000
36. 7146874×8191467

Rule, 2. When the multiplier is the product of any two or more factors, neither of which exceeds 12, multiply ſucceſſively by theſe factors.

1. 7849687×18
2. 679148 24
3. 919078 33
4. 871498 55
5. 378548×14
6. 919068 45
7. 748969 84
8. 487496 16
9. 9146374×72
10. 8098345×108
11. 6786348×112
12. 9687685×168

1, A field contained 645 ſhocks of 12 ſheaves each. Required the number of ſheaves?

2. How many letters are there in a page containing 45 lines, each line 59 letters?

3. Ninety-ſix perſons have a legacy divided among them, and the ſhare of each is 354*l*. What was the legacy?

4. What is a gentleman's yearly income who has 36 *l. per* week?

7. A

5. A gentleman gave his daughter a ſcrutoire in which was 12 drawers, each having 6 diviſions, and in each diviſion 134*l*. Quere the lady's fortune?

6. In a room 16 feet long and 14 feet broad; how many ſquare feet?

7. How many ſtones, each a foot ſquare, will lay a foot-path, half a mile long, and 7 feet broad?

8. How many grains of wheat will fill 987 buſhels, when 1 buſhel contains 675000?

9. How many ſtrokes does the hammer of a clock ſtrike in a year?

10. How many yds in a road 6 miles long, and 3 yds broad?

DIVISION

Teaches to find how often one number is contained in another. The firſt of theſe is called the diviſor, the other the dividend, and the number of times the diviſor is contained in the dividend, is called the quotient.

SIMPLE DIVISION.

Rule, To divide by any number, place the diviſor on the left hand of the dividend, with a ſtroke between them. Find how often the diviſor is contained in the feweſt figures poſſible on the left of the dividend, put the figure expreſſing the number of times on the right of the dividend, with a ſtroke between them; multiply the diviſor by it, place the product under the figures out of which it was taken, and ſubtract it from them, and to the remainder annex the next figure of the dividend; divide the number thus obtained in the ſame manner, and ſo on, until all the figures of the dividend are uſed.

Note, 1. *If the product exceeds the figures it is to be ſubtracted from, the quotient figure is too large; if the remainder be equal to, or exceed the diviſor, the quotient figure is too ſmall.*

2. *If the diviſor is 12, or under, the work may be performed mentally, and the quotient only put down.*

3. *If there are cyphers annexed to the diviſor, point them off, and proceed without them, remembering to point off as many figures on the right of the dividend, which at laſt annex to the remainder; whence, to divide by an unit with cyphers, is only to point off, from the dividend, an equal number of figures.*

EXAMPLES.

Divide 7841687858 by 4, 5, 6, 7, 8, 9, 10, 11, 12.

1. 23)107615827
2. 17)8416836
3. 26)8916084
4. 46)3609198594
5. 59)477826524
6. 74)6768701338
7. 58)4550728662
8. 79)67849168
9. 85)7774859645
10. 89)349168748
11. 97)8872486889
12. 99)9055424763
13. 98)74869435
14. 809)5502669904
15. 456)41709581053824
16. 305)2070784080
17. 897)72168551428
18. 475)117594325
19. 689)218860161
20. 3746)10140103590
21. 5682)839106396
22. 47269)3478100289
23. 3709)6349154
24. 8778)15678421
25. 87146)78419678
26. 417396)318998232168
27. 2719064)15359274703104
28. 67800)9774800000
29. 97000)1171454353000
30. 8700)12709830000
31. 24600)68092800000
32. 10746047)43521606407307
33. 804700625)166579474222305625

Rule, 2. When the diviſor is the product of any two or more factors, not exceeding 12, divide ſucceſſively by theſe factors.

Note, *To find the true remainder, multiply the laſt remainder by the firſt diviſor, and to the product add the firſt remainder.*

1. 48)85536
2. 72)149364
3. 144)28552
4. 28)495368
5. 64)29304
6. 81)835362
7. 88)6908352
8. 108)97994448
9. 121)470867628
10. 99)747781056
11. 72)56497608
12. 168)10655400

1. Divide an aſſeſſment of 5340*l*. equally among 12 counties?
2. The number of letters in a quarto volume which contained 4465 in a page, were 3393400. How many pages and ſheets were in it?
3. A plantation containing 10656 trees, conſiſted of 96 rows. How many were in each row?
4. A gentleman's income, *per* annum, is 788*l*. What is it *per* week?
5. The ſum of 4824*l*. is to be raiſed from 12 counties, in each of which are ſix pariſhes. How much muſt be levied from each pariſh?
6. The area of a room 18 feet broad is 360 feet. Required its length?

7. Twenty-

7. Twenty-one caſks contain 10941 herrings. How many are there in each caſk?

8. A multiplier is 789, and product 6678885. Required the multiplicand?

Proof, The operations of multiplication and diviſion being, in their nature and tendency, directly oppoſite to one another; the beſt method, perhaps, to prove multiplication, is to divide the product by either factor, the quotient will be the other factor, if the work is right. And to prove diviſion, multiply the quotient by the diviſor, adding the remainder (if any) and the product will be the ſame as the dividend.

REDUCTION

Teaches to change one denomination into another, without altering its value, and is performed by multiplication and diviſion.

Rule, To bring a greater name into a leſs,—Multiply.
To bring a leſs name into a greater,—Divide.

Always multiply and divide by the number of times, the leſs name is contained in the greater.

EXAMPLFS.

1. In 4678567 pounds. How many ſhil. pence, and farth.
2. In 47864 guineas, How many ſhil. pence, and farthings?
3. In 7846 crowns, How many ſixpences and threepences?
4. In 87496 pounds, How many crowns and ſixpences?
5. In 67*l* 18*s* 10¾*d*, How many farthings?
6. In 17*s* 0½*d*, How many halfpence and farthings?
7. In 78468 guineas, How many ſhil. fourp. and twopences?
8. In 8416 half-guineas, How many ſixpen. and halfpence?
9. In 4746 moidores, How many ſhil. groats, and halfpen.?
10. In 7849 joannes, How many ſhil. threepen. and pence?
11. In 78496 pounds, How many ſhil. groats, and halfpence?
12. In 6784 18*s* 11¼*d*. How many halfpence and farthings?

1. In 449142432 farthings, How many pen. ſhil. & pounds?
2. In 48246912 farth. How many pence, ſhil. and guineas?
3. In 156920 threepences, How many ſixp. and crowns?
4. In 3499840 ſixpences, How many crowns and pounds?
5. In 65227 farthings, How many pence, ſhil. and pounds?
6. In 409 halfpence, How many pence, ſhil. and pounds?
7. In 9886968 twopences, How many fourp. ſhil. & guineas?
8. In 2120832 halfp. How many pen. ſixp. and half-guin.?

9. In

9. In 3075408 halfp. How many groats, ſhil. and moidores?
10. In 6781536 halfp. How many threep. ſhil. and joannes?
11. In 37678080 halfp. How many groats, ſhil. and pounds?
12. In 6513550 far. How many halfp. pen. ſhil. and pounds?
1. In 4678*l*. How many half-crowns, ſixpen. and crowns?
2. In 78914*l*. How many crowns, ſhillings, and guineas?
3. In 914684 half-crowns, How many ſixp. ſhil. and joan.?
4. In 9146783 half-guineas, How many ſixp. and moidores?
5. In 714680 guineas, How many pounds and joannes?
6. In 87416835 joannes, How many crowns and fourpen.
7. In 73156780 moid. How many guineas and pounds?
8. In 41146788 groats, How many ſhil. and half-guineas?
9. In 43500*l*, How many ſhil. crowns, and pence?
10. In 4200 crowns, How many gui. ſhil. angels, and groats?
11. In 42 gui. 17*s* 8*d*, How many groats and half-crowns?
12. In 7465 joannes, How many pounds and guineas?
13. In 678498 jacobus', How many guineas?
14. In 46784966 pounds, How many nobles and marks?
15. In 784698460 jacobus', How many pounds and joannes?
16. In 526446 pounds, How many marks and nobles?
17. In 678498 nobles, How many pounds and quar. guineas?
18. In 4526457 marks, How many pounds and half-guineas?
19. In 7487 marks, How many twopences and crowns?
20. In 6784 pounds, How many crowns, half-crowns, and ſixpences, and of each an equal number?
21. In 63498 quarter-guineas, How many nobles?
22. In 896328 half-guineas, How many moidores?
23. In 57385 crowns, How many half-crowns and marks?
24. In 3 purſes, each 71 guineas, How many nobles?
25. In 640 joannes, How many crowns, ſhil. ſixp. and twopences, and of each an equal number?

§ 1. In 1 ton, How many cwt, qrs, lb, oz, drs?
2. In 56 ton, 17 cwt, 3 qrs, 14 lib, 11 oz, 13 drs, How many drams?
3. In 34 cwt, 3 lib, 13 drs, How many drs?
4. In 3 qrs, 14 lib, How many ounce?
5. In 27 lib, 10 drs, How many drams?
6. In 14 ton, 15 oz, How many ounces?
7. In 674968749 oz, How many lib, qrs, cwt, ton?
8. In 914674 drs, How many oz, lib, qrs, cwt?
9. In 896784 drs, How many oz, lib, qrs, cwt?
10. In 98968 oz, How many lib, qrs?

11. In

11. In 478698 drs, How many oz, lib?
12. In 91474684 ounces, How many tons?
§13. In 1 lib, How many oz, dwt, grs?
14. In 484 lib, 11 oz, 17 dwts, 23 grs, How many grs?
15. In 974 lib, 13 dwt, How many grs?
16. In 11 oz, 21 grs, How many grs?
17. In 7 lib 8 oz, How many ounces?
18. In 15 lib 3 dwts, How many grs?
19. In 46080 dwts, How many oz, lib?
20. In 78968 grs, How many dwts, oz, lib?
21. In 4919187 grs, How many dwts, oz, lib.
22. In 487496 grs, How many oz?
23. In 74916874 ounce, How many lib?
24. In 39168744 grs, How many lib?
§25. In 1 pound, How many oz. dr. ſcr. and grs?
26. In 689 lib, 17 grs, How many grs?
27. In 784 lib, 4 oz, How many ſcruples?
28. In 786496 ſcruples, How many lib.
29. In 3741935 grs, How many lib.
30. In 9146874 drs, How many lib.
§31. In 7487 yds 3 qrs, How many nails?
32. In 49010 yds 2 qrs, How many inches?
33. In 4 yds 2 qrs 3 nails, How many half-nails?
34. In 784680 nails, How many yards?
35. In 1764378 inches, How many yards?
36. In 9416874 half-nails, How many qrs?
37. In 78467 ells Engliſh, How many yards?
38. In 74875 ells Flemiſh, How many ells Engliſh?
39. In 79684 ells Flemiſh, How many yards?
40. In 914635 yds, How many ells Engliſh?
41. In 8768949 ells French, How many ells Flemiſh?
42. In 7469455 yds, How many ells Eng. and ells Fren.
§43. In 1 league, how many miles, furlongs, poles, yards, feet, inches, barley-corns?
44. In 78916480496 miles, How many yds?
45. In 3 leag. 2 mil. 6 fur. 7 inch. How many barley-cor.
46. In 47896840084 barley-corns, How many miles?
47. In 78914638914 yds, How many leagues?
48. In 30874968744 inches, How many miles?
§49. In 4678 acres, How many roods and perches?
50. In 578 acres 2 roods 17 pol. How many poles?
51. In 784 ac. 8 pol. How many yards?

52. In 478 acres 3 roods 18 falls, How many falls?
53. In 478964800 perches, how many acres?
54. In 987468946 poles, how many roods?
55. In 4874168498 yds, how many poles and roods?
56. In 4891467896 ells, how many acres?
§57. In 294 ſquare yds, how many feet and inches?
58. In 326592 ſquare inches, how many feet and yds?
59. In 38 yds 64 inches, how many inches?
60. In 98624 inches, how many feet?
61. In 243 ſolid yds, how many feet and inches?
62. In 13856832 ſolid inches, how many feet and yds?
§63. In 4786798948008 inches, how many gal. hhd. pun.
64. In 67849 puncheons, how many gal. and barrels?
65. In 5678496 pun. how many tierces and hhds?
66. In 134748 ankers, how many runlets?
67. In 7864 bar. beer, how many gall. and hhds?
68. In 8794 kilder. beer, how many gal. qts, and pints?
69. In 6784 hhds ale, how many gal. beer-meaſure?
70. In 6 hhds ale, how many bar. kil. fir. gal. pts?
71. In 4968 hhds beer, how many bar.
72. In 4398 hhds ale, how many gal. and kil.
73. In 10176 bar. ale, how many gal. qts. hhds?
74. In 7149168 pints ale, how many hhds?
§75. In 784 qrs. 3 pecks, how many gallons?
76. In 200710 gallons, how many qrs?
77. In 4783 qrs. 7 buſh. 3 p. 1 g. 3 qts, 1 pint, how many pints?
78. In 878468 pts, how many qrs?
§79. In 1 year 11 m. 29 d. 23 h. 59 ſec. how many ſec.
80. In a julian year, how many hours?
81. In a ſolar year, how many thirds?
82. In 1 year, or 365 days, 6 hours, how many ſeconds?
83. In 113604975554 thirds, how many years?
84. How many ſeconds have elapſed ſince the commencement of the Chriſtian Æra, this being 1790?

COMPOUND ADDITION.

Rule, Write like names under each other. Begin with adding the loweſt name, and for every one of the next higher, which that ſum contains, carry 1 to the next name; but firſt write down the exceſs, if any, under the denomination added; proceed in this manner, through all the denominations till the laſt, at which carry at 10, as in Simple Addition.

Note, *When a name conſiſts of two lines, add as in Simple Addition, and find the carriage upon the ſlate; except that in carrying at* 12, *or at a multiple of* 10, *the carriage may be found mentally.*

EXAMPLES.

1. £.	9	8	10	2. £.	8	17	5	3. £.	94	15	5¾	4. £.	816	17	8½
	8	16	11		5	8	6¼		87	16	6½		389	18	10¼
	7	8	3		7	4	4½		91	17	7½		31	17	11
	8	16	2		–	19	4¾		67	18	8¾		346	18	6½
	7	3	4		18	10	11		84	19	9½		407	13	8¾
	8	17	2		3	7	4		98	—	—¾		748	11	11
	3	8	11		5	12	7¾		56	17	11		567	14	4¾
	6	9	2		8	19	2		133	3	10¼		687	15	10¼

5. £. 17846 17 8+3479 13 11+6783 14 5+687 15 10+8412 11 4+6791 15 7+6149 17 8+8416 11 3+879 18 4+7358 13 8.
6. £. 4738 17 2+3947 19 8+7135 13 –+914 — 8+4783 15 11+7198 17 –+8359 11 8+8746 — –+879 8 7+9157 16 8.
7. £. 3109 — 11+798 13 4½+9146 13 7+874 – 8+9146 3 4+8749 13 5+8735 19 9+9146 17 8+874 13 4½+68 10 4¾.
8. £. 7148 11 8½+3596 18 11¼+71416 13 8½+81 11 4+7186 13 4¾+714 13 8¾+8196 18 10½+811 8 6.
9. £. 9148 11 9¼+4937 10 10¾+8719 11 10½+786 11 4¾ +91687 15 9½+87146 11 10½+6948 — 8¼+91468 19 –½+9143 15 8¼.
10. £. 87191 11 7½+81963 15 7¾+81648 19 9½+7146 13 4½+9146 17 8½+9146 17 4½+87146 17 11¼+9146 11 11+871416 13 9½.

	ton.	cwt.	qr.		lib.	oz.	dr.		cwt.	qr.	lb.	oz.	dr.		lb.	oz.	dwt.	gr.
11.	43	18	1	12.	23	15	13	13.	56	3	26	14	14	14.	58	11	15	18
	31	15	3		21	14	15		11	2	27	15	13		46	8	17	17
	71	16	2		8	—	13		3	1	18	13	12		8	7	18	15
	52	17	1		15	13	—		16	1	21	10	11		4-	4	19	18
	7	13	3		6	11	—		82	2	24	11	15		77	5	16	21
	6	14	3		7	8	7		6	3	25	12	11		6	7	13	23
	8	15	3		8	7	10		4	3	21	13	12		84	8	12	22
	59	16	1		24	15	11		9	2	17	14	13		5	9	11	14

	lib.	oz.	dwt.	gr.		lb.	oz.	dr.	ſc.	gr.		yd.	qr.	n.		le.	m.	f.	p.
15.	11	3	17	11	16.	4	11	7	2	11	17.	8	3	1	18.	4	2	7	19
	5	11	15	15		3	5	1	1	19		5	1	2		4	1	3	27
	16	5	16	18		7	—	4	2	4		13	-	1		8	1	4	35
	17	10	17	21		8	—	3	2	-		5	-	3		7	-	5	39
	18	8	18	23		9	6	-	-	1		6	2	2		4	-	6	18
	1	—	19	11		8	10	-	1	3		7	2	2		7	-	7	17
	15	11	19	10		7	2	5	1	2		8	3	3		6	2	5	15

	p.	yd.	ft.	in.		ac.	r.	p.		ac.	r.	p.	yd.		qr.	b.	peck
19.	15	4	2	11	20.	18	3	18	21.	7	1	18	15	22.	14	1	3
	13	5	-	3		15	1	39		5	3	19	29		13	7	1
	14	3	-	4		16	2	38		8	-	17	18		14	3	2
	18	2	2	9		18	-	28		18	-	38	28		13	4	2
	25	5	-	8		24	3	27		3	3	39	4		11	5	-
	29	4	1	11		25	3	19		4	2	15	7		12	6	3

	ton.	hd.	g.	pt.		hhd.	g.	pt.		hhd.	g.	qt.	pt.		days	h.	m.
23.	8	1	54	3	24.	9	51	3	25.	7	43	2	1	26.	243	18	40
	7	3	59	1		3	53	7		4	47	3	1		198	23	59
	4	-	62	7		9	52	1		16	45	1	-		214	13	41
	8	-	15	5		8	51	4		4	21	3	1		34	—	22
	3	2	39	6		5	21	2		3	25	2	1		29	21	—

Examples of Scots Weights and Meaſures.

	ſt.	lb.	oz.	dr.		ac.	r.	f.	el.		ch.	b.	fir.		gal.	pt.	m.	gi.
27.	15	8	13	15	28.	8	1	2	9	29.	8	14	2	30.	4	3	3	1
	14	15	14	13		7	1	9	18		7	15	3		3	7	1	3
	13	7	15	3		3	1	3	19		8	13	-		8	4	2	1
	8	—	—	14		4	2	7	7		4	14	1		7	6	1	2
	12	2	11	—		6	1	4	4		6	—	3		6	3	2	2
	18	7	3	15		9	1	7	19		9	12	3		4	2	1	3

31. A owes to B 475*l* 18*s* 11*d*, to C 748 18 9½, to D 37 19 8¾, to E 974 19 0½, to F 14 6 0¼, to G 18 0 11, to H 1984 17 0, K 15 0 6½. Required A's debt?

32. A Merchant has in caſh 148*l* 17*s* 8*d*. Wine to the value of 718 11 8. Rum 398 18 5½. Brandy 178 19 11. Gin 918 13 11. Tea 518 11 11. Sugar 315 19 8½. Various other goods 317 19 8. Required his ſtock?

33. A Woollen-Draper has in his ſhop, of blues 314 yards, 3 quarters 2 nails, of blacks 204 yds 3 n. of browns 654 yds 2 qr. 3 n. of ſcarlets 71 yds 1 qr. 2 n. of mixtures 854 yds, of various other colours 763 yds 3 nails. Required how much he has in all?

34. A Servant went to market and laid out on Tea 2*l* 4*s* 8½*d*, on Coffee 1*l* 5*s* 8¾*d*, on Sugar 3*l* 17*s*, on Beef 1*l* 7*s*, on Mutton 36*s*, on Veal 7*s*, on various other articles 29*s*. How much was laid out in all?

35. A bankrupt owed to one of his creditors 784*l* 18*s* 11½*d*, to another 315*l* 17*s* 8*d*, to another 88*l* 0*s* 11¾*d*, to another 778*l* 15*s* 8*d*, to another 785*l* 17*s* 11½*d*, to another 13*l* 8*s* 6½*d*, to another 57*l* 18*s*, to another 318*l*, to another 154*l* 11*d*. Required his whole debt?

36. J carried to market 437*l* 18*s* 10*d*, and received there from A 54*l* 8*s* 8*d*, from B 78*l* 13*s* 9*d*, from C 34*l* 8*s*, from D 87*l* 8*s* 10*d*, from E 54*l*, from F 18*s* 10½*d* from G 13*s* 11¾*d*, from H 15*l* 18*s* 0¾*d*. How much had J in all?

37. A collector drew in January 67*l* 18*s* 8*d*. Feb. 63*l* 14*s* 9*d*. March 94*l* 18*s*. April 93*l* 19*s*. May 108*l* 17*s* 11*d*. June 118*l* 13*s* 6¼*d*. July 99*l* 13*s* 6¾*d*. Auguſt 73*l* 19*s* 9¾*d*. Sept. 53*l* 15*s* 9*d*. Oct. 68*l* 0*s* 11*d*. Nov. 48*l* 18*s* 10*d*. Decem. 73*l* 11*s* 8*d*. How much did he collect during the year?

38. A merchant has in caſh 99*l* 8*s* 6*d*. Broad cloth, value 342*l* 18*s*. Narrow ditto 224*l* 14*s* 8*d*. Serges 13*l* 7*s* 8½*d*. Shalloons 18*l* 17*s* 11¼*d*. Flannels 12*l* 11*s* 7¼*d*. Thread 2*l* 6*s* 9½*d*. Buckram 4*l* 19*s* 11½*d*. Hoſe 17*l* 18*s* 9*d*. Stockings 18*l* 17*s* 8. Hats 21*l* 19*s* 6*d*. Houſe and ſhop 221*l*. Alſo, A owes him *per* bond 888*l*, B *per* ditto 756*l*, C 374*l*. M *per* account 23*l* 18*s* 11*d*, N 14*l* 18*s* 6*d*, P 56*l* 19*s* 5*d*, Q 73*l* 14*s* 9*d*, R 13*l* 18*s*, S 17*s* 8½*d*, T 1*l* 6*s* 8¾*d*, W 19*s* 11¾*d*, X 13*s* 4*d*, Y 15*s* 8*d*, Z 18*l* 14*s* 10*d*. Required his ſtock?

39. Required the amount of the following ſums, due by a

certain Bank, *viz.* to A 687*l* 17*s* 11½*d*, to B 677*l* 18*s* 10½*d*, to C 345*l* 14*s* 9¾*d*, to D 789*l* 15*s* 8*d*, to E 467*l* 16*s* 7½*d*, to F 912*l* 17*s* 4*d*, to G 456*l* 18*s* 6½*d*, to H 891*l* 19*s* 8¼*d*, to K 345*l* 10*s* 7¼*d*, to L 789*l* 18*s* 4*d*, to M 234*l* 14*s* 9¼*d*, to N 678*l* 15*s* 6*d*, to O 123*l* 16*s* 4¾*d*, to P 567*l* 7*s* 8*d*, to Q 912*l* 18*s* 9¾*d*.

40. The produce of a Sugar plantation for 16 years, was as follows: Year 1*ſt*, 687 cwt. 3 qr. 27 lb. 15 oz. 14 drams. —2*d*, 958 1 26 13 15.—3*d*, 436 2 24 14 13.—4*th*, 891 1 25 13 15.—5*th*, 648 3 27 13 14.—6*th*, 168 1 23 14 13.—7*th*, 734 2 2 15 14.—8*th*, 687 2 22 13 13.—9*th*, 434 2 23 10 13.—10*th*, 578 3 19 11 15.—11*th*, 916 1 18 12 14.—12*th*, 876 1 14 13 12.—13*th*, 914 3 15 14 14.—14*th*, 768 1 16 15 13.—15*th*, 696 3 13 14.—16*th*, 768 1 14 14 14. Required the total produce?

41. A builder paid for ground to build a houſe 250*l*, Maſon's bill 424*l* 17*s* 6*d*, Carpenter's 621*l* 15*s* 9*d*, Slater's 210*l* 13*s* 4*d*, Smith's 17*l* 18*s* 9*d*, Glazier's 74*l* 18*s* 11*d*. Required at what he can ſell it to gain 150*l* by it?

42. A Gentleman is poſſeſſed of ſilver-plate, *viz.* Spoons, weight, 11 lb. 11 oz. 19 dwt. 22 grs. Teapot 3 lb. 9 oz. 17 dwt. 19 grs. Knives and forks 5 lb. 10 oz. 15 dwt, Salts 3 lb. 17 dwt, 13 grs. Salvers 11 lb. 11 oz. 23 grs. Tankards 11 lb. 11 oz. 19 dwt. 22. Vaſes 28 lb. 3 oz. 17 dwt. 15 grains. Required the total weight of his plate?

43. Required the content of a gentleman's eſtate, conſiſting of the following farms: *viz.* 1*ſt*, 467 acres 3 roods 18 pol. 2*d*, 678 2 27. 3*d*, 876 3 37. 4*th*, 678 3 39. 5*th*, 326 1 33. 6*th*, 146 3 34. 7*th*, 47 1 21. 8*th*, 89 2 34. 9*th*, 17 1 31. 10*th*, 147 3 15. 11*th*, 134 2 37. 12*th*, 108 acres 2 roods 4 poles?

44. From London to Hatfield is 20 miles 1 furlong 14 p. 3 yds, from thence to Bigiliſwade 26. m. 1 fur. 4 p. ½ yd, from thence to Stilton 30 miles 19 p. from thence to Coleſworth 28 m. 15 p. 3 yds, from thence to Newark 22 m. 1 fur. 2 p. 1 yd, from thence to Doncaſter 37 m. 1 f. 7 p. 2 yds, from thence to York 37 miles 12 p. 1 yard. Required the diſtance from London to York, and from each of theſe towns to each of the reſt?

Compound Subtraction.

Rule, Write like names under each other. Begin at the loweſt name, and ſubtract the numbers of each name in the ſubtrahend from their like names in the minuend, borrowing in any name at the number of times it is contained in the next greater.

EXAMPLES.*

From	£. 784	18	11	Cwt.	623	1	21	13	11
Take	358	14	5		435	2	27	14	15

1. A Merchant has in caſh 474l 8s 9d. Goods, value 3443l 15s. A houſe 713l 11s. A ſhip 574l, another 315l. Debts due to him 957l 18s 11½d. He owes to A 115l 7s 8d, to B 327l 18s 4¼d, to C 74l 13s 4d. Required his nett ſtock?

2. A borrowed from B, at ſundry times, the following ſums, *viz*. 781l 63l 15s 52l 10s 565l; and has paid as follows, at different times in caſh 330l 10s, 54l 13s 4d, 67l 10s, in goods 54*l* 18s 6d, 73l 15s 8d, by a draught on John Steel 63l. What is A ſtill due?

3. A bankrupt owed to one of his creditors 678l 18s 10d, to another 773l 17s 6d, to a third 541l 17s 6½d. *4th*, 168l 18s 8d. *5th*, 764l 13s 4d. *6th*, 987l 14s. *7th*, 896l 19s. *8th*, 871l 17s 8d. *9th*, 173l 17s 11d *10th*, 999l 15s. *11th*, 479l 16s 9d. His effects were as follows: Debts due to him by A 217l 8s 8d, by B 113l 17s 9d, by C 434l 8s 9d, by D 454l 16s 8d, by E 137l 19s 6d, by F 73l 18s 10½d, by G 64l 11s 8d, by H 206l 13s 11d, a houſe 350l, two more, each 546l, furniture, 215l 18s 11d, cloth, value 213l 14s 8d, linen 313l 8s, tea, in three lots, for 33l 18s 10s 44l 18s 11d 96l 17s 8d, port wine 4 hhds at 19l 13s each. Required a ſtate of his affairs?

4. A merchant has in caſh 146l 18s 11d, in goods, *viz*. cloth, value 212l 14s 6d, linen 311l 4s, cambrics and lawns 256l 14s 6d, muſlins 217l 19s 11d, ſilks 314l 18s, cottons 178l 13s 8d, ſtockings 73l 14s 6d, hats 87l 13s 11d, gloves 24l 13s 9d, houſe and ſhop 256l. A owes him 737l, B 113l 8s, C 56l 13s 11d.—He owes as follows: *viz*. To four wholeſale dealers 156l 10s 9d, 297l 17s 11d, 384l 16s 8d, 21l 17s 7d, to three manufacturers 38l 18s 4d, 47l 13s 11d, 33l 15s 5d. Alſo, to M 13l 6s 6d, to N 25l 4s 6d,

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* Take more examples from the two firſt lines of thoſe in Addition.

to P 17l 18s 10d, to Q 15l 10s, to R 23l 17s 11d, to S upon bond 155l. Required his nett ſtock?

5. A goldſmith purchaſed ſilver, *viz.* From A 25 lb. 10 oz. 13 dwt. from B 13 lb. 15 grs, from C 19 lb. 8 oz. 19 dwt. 23 grs, from D 14 lb. 8 dwt. 22 grs, from E 16 lb. 11 oz. 15 grains; of which he made into tea-ſpoons 31 lb. 18 grs; knives and forks 21 lb. 10 dwt.; four teapots, each 3 lb. 2 oz. 15 dwt. 13 grs. Sold at three different times 13 lb. 4 oz. 15 dwt. 3 lb. 14 dwt. 22 grs. 8 lb. 16 dwt. 19 grs. Required how much he had remaining?

6. A gentleman gave a ſilverſmith 32 lb. of ſilver to make into knives and forks, weight 7 lb. 15 dwt., three vaſes, each 4 lb. 11 oz. 12 grs, ſpoons 6 lb. 5 oz. 13 dwt. 15 grs. ſalvers 1 lb. 2 oz. 14 dwt. 18 grs, the reſt to be made into a punch bowl. Required its weight?

7. A merchant bought 3 hhds of ſugar, each 4 cwt. 3 qrs. 16 lb. of which he retailed as follows: *viz.* 2 cwt. 13 lb. 1 cwt. 2 qr. 18 lb. 15 dr. 3 cwt. 3 qr. 27 lb. 15 dr. 3 qr. 17 lb. 12 dr. 23 lb. 15 dr. 15 lb. 13 oz. 14 dr. 17 lb. 11 oz. 15 dr. 2 cwt. 16 lb. 11 oz. 12 dr. How much had he on hand?

8. A trader owed to A 357l 18s 10½d, of which he has paid 249l 19s 11¾d, to B 287l 18s, of which he has paid 198l 19s 11d, to C 487l 19s, paid 298l 13s 8¼d, to D 78l 17s 9d, paid 39l 18s 11½d, to E 59l 13s 6d, paid at three different times 13l 15s 6d, 17l 11s 3d, 19l 8s 11d. How much is the trader ſtill due to each, and to the whole?

9. A gentleman has an eſtate of 3465 acres, he farms off to A 463 ac. 2 r. 14 pol., to B 146 ac. 3 r. 15 p., to C 713 ac. 1 r. 17 pol., to D 831 ac. 37 pol., to E 547 ac. 38 poles, to F 496 acres 3 roods 39 poles. How much remains in his hand?

10. A Wine merchant bought 47 hhds 17 gal. of wine; ſold 13 hhds 8 gal. 7 pts; bought 33 hhds 38 gal. 5 pts; ſold 44 hhds 47 gal. 3 pts; bought 54 hhds 19 gal. 3 pints; ſold 45 hhds 62 gal. 7 pts; bought 96 hhds 43 g. 2 pts; ſold 57 hhds 13 gal. 6 pts; bought 23 hhds 57 gal.; ſold 45 hhds 12 g. 4 pts; bought 91 hhds 54 gal. 6 pts; ſold 34 hhds 18 gal. 5 pints. Required the quantity remaining unſold?

11. A brewer has in his cellar 173 hhds 17 gal. of beer, of which he ſent to ſix cuſtomers as follows: *viz.* 1*ſt*, 17 hhds

15 gal. 5 pts. 2*d*, 2 hhds 53 gal. 7 pts. 3*d*, 21 hhds 13 gal. 4 pts. 4*th*, 23 hhds 14 gal. 3 pts. 5*th*, 12 hhds 18 g. 3 pts. 6*th*, 15 hhds 51 gal. 7 pints: By this time he had brought into his cellar 24 hhds more; and ſent to three more of his cuſtomers 7 hhds 39 gal. 5 pts each. How much remained in his cellar after theſe tranſactions?

12. A collector of ceſs gave receipts to one part of his diſtrict for 304l 18s 8d, to another for 256l 13s 4d, to another for 417l 18s 11¼d, to another for 784l 18s, to another for 964l 13s 9d, to another for 1000l, to another for 98l 17s 10¾d, to another for 294l 18s 11d. His own ſalary was 140l; he paid three clerks 40l, 30l, 25l; to ſix ſub-collectors, each 35l. Quere the nett revenue?

13. A ſtate of X's debts is as follows: To A, on bond, 756l 18s 10d, with intereſt 42l 18s 6d; of which he has paid 378l 15s 10d, to B 456l 18s 8d, intereſt 23l 18s 4d; of which he has paid 208l 14s, to C 574l 10s 8d, intereſt 37l 10s 10d, paid 318l 17s 8d, to D 517l 4s 6d, paid 113l 11s 9d, to E 377l 19s 11d, intereſt 17l 19s, paid 137l 10s 6d, to F 391l 10s, intereſt 31l 17s 10d, to G 474l 17s 9½d, intereſt 94l 7s 8d, paid 191l 19s 11d, to H 577l 11s 8d, intereſt 35l 17s 9½d, of which he has paid 398l 17s 9d, to K 1000l, intereſt 50l, paid 273l 17s. Required how much money X will want to clear his debts?

14. Required the nett weight of 8 hhds tobacco, qt. No 1*ſt*. 8 cwt. 3 qr. 14 lb. tare 3 qr. 17 lb. No 2*d*. 7 cwt. 2 qr. tare 3 qr. 11 lb. No 3*d*. 5 cwt. 1 qr. 16 lb. tare 2 qr. 26 lb. No 4*th*. 9 cwt. 1 qr. 7 lb. tare 3 qr. 27 lb. No 5*th*. 8 cwt. 1 qr. tare 3 qr. 5 lb. No 6*th*. 4 cwt. 3 qr. tare 1 qr. 7 lb. No 7*th*. 6 cwt. 2 qr. tare 2 qr. 27 lb. No 8*th*, 7 cwt. 3 qr. 18 lb. tare 2 qr. 22 lb.

15. Eight hhds of ſugar weigh as follows: No 1*ſt*. 27 cwt. 3 qr. 14 lb. tare 1 cwt. 13 lb. No 2*d*. 37 cwt. 27 lb. tare 1 cwt. 3 qr. 8 lb. No 3*d*. 21 cwt. tare 1 qr. 27 lb. No 4*th*. 43 cwt. tare 1 cwt. 1 qr. 19 lb. No 5*th*. 17 cwt. 18 lb. tare 2 qr. 20 lb. No 6*th*. 19 cwt. 1 qr. 5 lb. tare 26 lb. No 7*th*. 47 cwt. tare 1 cwt. 3 qr. 25 lb. No 8*th*. 44 cwt. 2 qr. 17 lb. tare 1 cwt. 17 lb. Required the nett weight of each hhd, and the groſs, tare, and the nett weight of the whole?

Compound Multiplication.

Rule 1. When the multiplier is 12, or under, write the multiplier under the loweſt name of the multiplicand. Multiply its ſeveral denominations in ſucceſſion, beginning at the loweſt; and carry as in Addition.

EXAMPLES.

1. £4 6 7½×3
2. 9 8 4¼×4
3. 74 18 11½×6
4. 17 3¾×7
5. 18 — 11 ×8
6. 17 15 0¼×9
7. 13 5 7¼×10
8. 4¾×11
9. 15 0 7½×4
10. 17 8 0¾×5
11. 9 7½×7
12. 18 – 4¼×11
13. 70 0 11½×12
14. 73 0 8×11
15. — 19 8×10
16. 54 13 –×9
17. 73 17 8¾×11
18. 57 19 —×12

1. 7 cwt. 2 qr. 18 lb.×9
2. 15 lb. 13 oz. 5 dr.×11
3. 18 lb. 3oz. 14 dwt. 3 g.×12
4. 74 lb. 11 oz. 5 dr. 2 ſc.×12
5. 37 ton 15 cwt. 2 qr.×4
6. 15 lb. 13 oz. 3 dr.×5
7. 13 lb. 3 oz. 8 dwt. 5 gr.×6
8. 54 m. 3 fur. 18 p. 3 yds×7
9. 49 hhds wine 13 gal.×8
10. 7 buſh. 3 p. 2 pts×3
11. 74 hhds 47 gal. ale,×8
12. 3 y. 5 m. 29 days×9
13. 2 days 3 ho. 59 m.×10
14. 14 ac. 3 r. 39 p.×9
15. 8 ac. 2 r. 14 p.×11
16. 365 d. 5 h. 48 m. 57 ſe.×12
17. 84 hhds 17 gal. ale×11
18. 55 hhds 19 g. 5 pts be.×12

Rule 2. When the multiplier exceeds 12, and is the product of any two or more factors, neither of which exceeds 12; multiply ſucceſſively by theſe factors.

1. 63 – 8¾×18
2. 17 11 8¼×20
3. 13 17 0½×36
4. 27 18 — ×45
5. — 17 11¼×56
6. — — 10¾×72
7. 23 15 — ×24
8. 15 – 8 ×30
9. 13 15 11½×42
10. 17 4 — ×48
11. 54 13 0¼×60
12. — 19 11¾×84
13. 15 18 11¼×16
14. 37 7 — ×36
15. 7 8 11¾×88
16. 8 8 — ×108
17. 19 11 4×144
18. 17 5 –×168
19. 37cwt 3q. 16lb.×15
20. 17 lb. 15 dr.×24
21. 21 lb. 13 dwt. 17 grains×77

Rule 3. When the multiplier is not the product of any two or more factors—Firſt, Multiply, *as in the laſt caſe*, by two ſuch factors as come neareſt the given multiplier; next, by what theſe factors want of that multiplier. Add theſe products.

1. £.3 7 0¼×17 6. 77 18 0¼×59 11. 62 13 8×58
2. 4 – 3½×23 7. 63 17 8 ×19 12. 18 19 –×61
3. 7 – –¾×41 8. 53 13 8¾×39 13. 77 13 4×68
4. – 7 8¼×51 9. — 14 8¼×47 14. 33 4 6×74
5. 18 11 4 ×53 10. — 19 4½×57 15. 14 7 –×82

Rule 4. When the multiplier is large, multiply continually by 10, until the value of 100, 1000, &c. according as the queſtion requires, is obtained; next, the value of 1, 10, &c. multiplied by 2, 3, &c. will give the value of as many of any of theſe as is required. Add theſe products.

1. 57 18 9½×348 5. 77 11 4¼×6352 9. 18 11 11 ×9145
2. 99 13 6 ×3469 6. 79 19 8 ×10002 10. 6 7 8 ×632
3. 84 13 9 ×4660 7. 137 18 4½×1141 11. 4 18 9½×561
4. 1 15 0½×7841 8. 15 18 3 ×673 12. 7 11 11¾×423

Practical Queſtions.

What is the price of

1. 14 cwt. ſugar, at 2l 10s 7½d *per* cwt.
2. 7 ſtone wool at 18 7¾ *per* ſt.
3. 11 lb. tea at 13s4¾ *per* lb.
4. 12 yds velv. at 17 8½ *p.y.*
5. 15 ſtone ſugar at 9 10¾
6. 18 ſtone ſteel at 10 11¼
7. 37 oz. ſilver at 5 5¼
8. 20 cwt. figs 1 4 8½
9. 24 ſett chin. at 1 15 4¾
10. 27 ſheep at 2 5 9½
11. 57 yds ſilk at 1 7 8½
12. 32 yds velvet at 2 8 9½
13. 51 yds ditto at 1 15 9½
14. 35 caſks rum at 2 17 6½
15. 40 ditto wine at 3 12 11¼
16. 76 cwt. raiſins at 2 18 9¾
17. 45 cwt. iron at 1 4 7½
18. 60 bales cotton 3 14 4¾
19. 65 ditto ditto at 1 17 6½
20. 72 bar. tar at 2 15 4¼
21. 82 bar. do at 1 17 5½
22. 85 ſtone ſteel at 4 9¾
23. 35 ſcore lambs at 8 15 4½
24. 52 weeks wages at 14 6½
25. 8 yds demity at 9 8¼
26. 9 yds cotton at 11 5½
27. 42 yds ſilk at 1 16 7½
28. 56 yds lawn 14 4½
29. 40 yds cloth at 1 19 4¼
30. 99 yds ſilk at 5 6 d
31. 42 lb. tea at 13 4½
32. 31 hhds flax at 3 4 8½
33. 33 pipe wine at 12 8 6d
34. 83 pun. rum at 25 12 8
35. 97 yds muſlin at 4 9½
36. 21 yds linen at 3 7d
37. 77 yds velvet at 12 0¾
38. 73 lb. cloves at 15 6½
39. 99 bar. raiſins at 4 3 7½
40. 75 ditto figs at 1 19 8½
41. 336 lb. coffee at 4 6d
42. 87 yds muſlin at 4 9d
43. 350 yds ditto at 7 0½
44. 89 lb. ſnuff at 1 6¾
45. 450 yds ſilk at 2 3 11¼

46. 95 ſtone of wool at 14s 7d *per* ſtone

47. 102 ditto at 33s 11d

48. 29 ſcore lambs at 4l 5s

49. What is the weight of 47 hhds tobacco, each 6 cwt. 2 qr. 17 lb. 13 drams?

50. —— 98 ingots of ſilver, each 2 lb. 11 oz. 17 dwt?

51. —— 45 ditto, each 3 lb. 7 oz. 14 dwt. 13 grs?

52. —— 7 parcels of medicine, each 1 lb. 10 oz. 7 dr. 1 ſcr. 17 grains?

53. —— 486 guineas, each 5 dwt. 9 grains?

54. What length of road will a man make in 39 days at 1 pole 5 yds 3 feet 4 inches *per* day?

55. How large is an eſtate conſiſting of 9 farms, each 47 ac. 2 roods 13 poles 29 yds?

56. How much flour will a mill grind in 313 days, at 1 qr. 3 buſh. 3 pecks *per* day?

57. What quantity of wine will be conſumed in a year at 3 ton 3 hhds 57 gal. 5 pints *per* day?

58. What quantity of beer and ale in the ſame time, at 468 hhds 43 gallons 7 pints *per* day?

59. How far will a man travel in 43 days at 37 miles 5 furlongs 18 poles *per* day?

60. In what time could 9 houſes be built, if each, at a medium, require 1 year 11 months 29½ days?

Compound Diviſion.

Rule 1. Begin at the higheſt denomination. Divide it as in Simple Diviſion. Reduce the remainder into the next inferior name, adding the given number of that name; divide this in the ſame manner, and ſo on till the loweſt.

Note, *If the diviſor is* 12, *or under, work mentally.*

1. 4) 57 18 9
2. 6) 33 17 6
3. 5)798 13 4
4. 6) 87 15 6
5. 7) 54 15 8
6. 8) 91 13 8
7. 6)899 7 6
8. 7) 6 1 2¼
9. 8)498 17 8
10. 9)195 15 2¼
11. 11) 7 10 4
12. 11) 73 17 8
13. 12) 17 1 7
14. 11)812 15 0¼
15. 12) 8 19 –
16. 4)118 lb. 8 oz. 7 dwt.
17. 5)27 lb. 8 oz. 10 drams
18. 10)19 lb. 11 oz. 3 dr. 2 ſcr.
19. 5)73 yds 1 qr. 3 na.
20. 7)149 lb. 3 oz. 15 dwt. 22 grains
21. 6)107 yds 2 foot 6 inches
22. 3)53 yds 2 foot 11 inch.
23. 5)87 miles 30 poles
24. 12)176 yds 1 quarter
25. 5)39 hds 62 gal. 3 pts
26. 9)64 hhds 61 gal. 7 pts

27. 9)68 cwt. 3 qrs. 22 lb.
28 11)167 lb. 4 oz. 7 dr.
29. 12)74 lb. 11 oz. 6 dr.
30. 12)54 ac. 2 r. 4 poles
31. 8)302 ton 4 cwt.
32. 10) 158 lb. 3 oz. 14 dr.

1. 17) 18 7 6
2. 23) 27 12 –
3. 26) 10 8 6½
4. 31) 17 1 7¾
5. 43) 38 2 4¼
6. 38)167 7 7
7. 65)418 13 4
8. 69)999 18 6
9. 71)341 16 8½
10. 74)488 15 8½
11. 78)500 18 1½
12. 87)931 19 9
13. 89)478 13 0¾
14. 79)118 15 7
15. 97) 918 17 5½
16. 98)1118 13 6
17. 104)332 18 2
18. 109)102 10 6¾
19. 231)207 8 4½
20. 758)9814 10 5
21. 317)215 12 6¼

22. 23)490 lb. 3 oz. 5 dwt. 3 grains
23. 57)1025 yds 1 foot 5 in.
24. 61)1062 m. 4 fur. 14 p.
25. 19)142 hhds 29 g. 1 pt
26. 17)249 yds 2 quarters 3 nails
27. 29)168 acres 3 poles

Rule 2. When the diviſor is the product of any two factors, not exceeding 12; divide ſucceſſively by theſe factors.

£. s. d.
1. 24) 7 6 0
2. 36) 64 19 0
3. 48) 37 14 8
4. 42)380 9 0
5. 16) 78 16 8
6. 55)9134 1 8
7. 63)529 4 0
8. 72)56 14 0

£. s. d.
9. 90) 22 6 3
10. 30) 37 5 7½
11. 45) 4 4 4½
12. 56) 22 1 0
13. 50)135 0 0
14. 36) 38 8 0
15. 64)198 8 0
16. 72)113 8 0

£. s. d.
17. 21)37 16 0
18. 99)93 16 10½
19. 84)75 12 0
20. 120)45 0 0
21. 96) 9 2 0
22. 132)36 6 0
23. 336)81 4 0
24. 112)21 4 8

25. 14)104 hhds 61 g. 2 pts
26. 21)447 lb. 7 oz. 13 dwt. 9 grains
27. 54)971 yds 1 foot 6 in.
28. 56)975 m. 3 fur. 24 p.
29. 28)162 acres 36 poles

Practical Queſtions *.

1. If 11 yds of cloth coſt 4l 5s 0½d, what is the price of 1 yd?
2. A perſon ſold 9 pſs of lawns, each 11 yds, at 38l 5s 2¼d, what was the price *per* yard?
3. If 47 lb. tea coſt 34l 10s 3¾d, what is it *per* lb?
4. If a farm of 57 acres is let at 55l 4s 4½d, what is the rent *per* acre?
5. If 9 hhds ſugar weigh 68 cwt. 3 qrs 22 lb. Required the weight *per* hhd?

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* For more, the learner may reverſe the practical queſtions given in multiplication.

6. Three men A, B, C, make an adventure, each equally concerned, whereby they clear 370l, what was each man's ſhare of the gain?
7. Seven men are equally concerned in an adventure to Madeira, whereby they loſe 878l 3s, what was the loſs of each?
8. Divide 3l 10s among 5 men and 6 women, and give each man thrice the ſhare of a woman.

An Exerciſe upon the preceding Rules.

1. In 48 purſes, each containing a joannes, a moidore, an half-guinea, and half-crown, how many pounds?
2. In 10602 dollars, each 4s 3d, how many pounds?
3. In 5170 piſtols, each 17s 6d, how many guineas?
4. In 74867 moidores, how many dollars, each 4s 6d?
5. In 678495 ells Scotch, how many yards?
6. With how many piſtols of 18s 6d, could I pay 2717l?
7. How many dollars, each 4s 3d, are equal to 13121 3s 9d?
8. In 1939l 11s 8d, how many florins, each 3s 2d?
9. A gentleman was robbed of the following ſums; *viz.* 54 pieces of 3l 12s each, 48 of 36s each, 234 of 16s 6d each, 196 of 27s each, 215 of 4s 9d each, 464 notes 50l each. Required the amount of his loſs?
10. How many lib. of ſilver in 2 dozen diſhes, each diſh weighing 25 oz. 15 dwt. and 2 dozen plates, each 15 oz. 15 dwt. 22 grains?
11. How many hhds ſugar, each 11½ cwt. in 141680 lb?
12. How many caniſters, each holding 12 lb., can I fill out of 25 cwt. 2 qr. 24 lb. of tea?
13. In 1463645160 yds, how many ells Scotch?
14. How many barleycorns will reach round the terreſtrial globe, it being 360 degrees, and each degree 69½ miles?
15. How many ditto will reach round the globe of the moon, its circumference being 6817 miles 2 furlongs 7 poles?
16. In 20790 gallons, how many pipes, puncheons, hhds, and tierces, and of each an equal number?
17. There are 63 ſtacks of corn, each computed to contain 3 qr. 5 buſhels 2 pecks, how much is contained in the whole?
18. The planet Mercury revolves 148 times round the ſun in 35 years 249 days. Required the time of one revolution?

19. The diſtance between London and Edinburgh is 390 miles, how often will a coach-wheel of 15 feet circumference, revolve in performing the journey ?

20. How many letters in a book of 12 volumes, each 421 pages, each page 36 lines, and each line 38 letters ?

21. Required the nett weight of 11 hhds, each 6 cwt. 1 qr. 12 lb. tare 1 qr. 14 lb. *per* hhd ?

22. Divide 261 3s 11½d among 4 men, 6 women, and 8 children ; and give each man double a woman, and each woman triple a child.

23. Saturn performs his periodic revolution in 10759 days 8 hours, and Mars in 686 days 23 hours 30½ min. how many has each of them performed ſince the commencement of time and things, reckoning it 5794 years ?

24. If 6 cheſts of Bohea weigh 8 cwt. 1 qr. 18 lb. what is the weight *per* cwt ?

25. A gentleman has two dozen table ſpoons, each 2 oz. 14 dwt. 3 dozen tea ditto, each 14½ dwt. 4 mugs, each 13 oz. 17 dwt. 2 tankards, each 23 oz. 13 dwt. Required the weight of the whole ?

26. If 15 hhds ſugar weigh 52 cwt. 26 lb. Quere the weight of 1 hhd ?

27. What is the nett weight of 7 hhds of ſugar, each 3 cwt 2 qr. 17 lb. tare 18 lb. *per* hhd ?

28. —— of 56 hhds, each 3 cwt. 24 lb. tare 16 lb. *per* hhd ?

29. —— of 36 hhds, each 8 cwt. 3 qr. tare 18 lb. 2 oz. 12 drams *per* hhd ?

30. —— of 5 hhds, each 6 cwt. 2 qr. 14 lb. tare 3 lb. 4 oz. *per* hhd ?

31. A merchant paid 89l 6s 5½d for 5 pieces of cloth, each 25 yds ; at what muſt he ſell it *per* yard, to gain 1l 11s 3d on the whole ?

32. A merchant paid 64l 18s for 288 yds of cloth, which getting damaged he is content to loſe 1l 13s by it, at what muſt he ſell it *per* yard to loſe ſo much ?

33. A merchant bought 7 pieces of cloth, each 27 yds at 55l 12s, and ſold 56 yds of it at 5s 3½d *per* yard, and the reſt at 6s 8d ; whether did he gain or loſe by it, and how much ?

34. If a workman gains every week 12s 6d, and ſpends 9s 11¾d, how much does he lay up in a year ?

35. If a man gains 1s 9d *per* day, and ſpends thirteenpence halfpenny, how much does he lay up in a year ?

36. If a perſon's income is 4s 6d *per* day, and expences 71l 1s 6d *per annum*, how much does he lay up, or overſpend *per annum*, and how much does he ſpend *per* week?

37. If 5 men, equally concerned in an adventure, clear each 114l 18s 6d, what was gained upon the whole?

38. Four men have an equal ſhare of a voyage to Jamaica, whereby they loſe 348l 15s; what was the loſs of each?

39. What was the ſtock of that trading company which conſiſted of 76 ſhares, each 784l 13s 6d?

PROPORTION.

Proportion is ſaid to be Simple or Compound, according as the proportion depends on one condition only, or on more than one.

Simple Proportion.

In Simple Proportion three numbers, or terms, are given to find a fourth.

Of the three given terms, two are always of the ſame kind; the other is always of the ſame kind as the fourth, or term required.

Rule, 1. *To State the Terms.*

Place that term which is of the ſame kind as the term required, in the middle, with two points before and four after it.—Then conſider from the ſenſe of the queſtion, whether the anſwer ought to be *greater* or *leſs*, than the middle term; if *greater*, put the leaſt of the remaining terms on the left-hand of the middle term, and the greater on its right; but if *leſs*, the contrary.

2. *To Reduce the Terms*[*].

If the firſt and third terms are of different names, reduce them into the ſame, and the middle term into the loweſt name in it.

3. *To find the fourth Term, or anſwer.*

Multiply the two laſt terms together, and divide the product by the firſt; the quotient is the fourth term, and is always of that name the middle term was reduced into.

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[*] If the middle term is of different names, and can be conveniently multiplied by the third.—Multiply and divide as directed in Compound Multiplication and Diviſion.

If 4 yards of cloth coſt 3s, what will 24 yds coſt? *
If 24 yds of cloth coſt 18s, what will 4 yds coſt?
If I get 4 yds of cloth for 3s, how many will I get for 18s?
If I get 24 yds for 18s, how many will I get for 3s?

§1. If 17 yards of cloth coſt 4l 5s, what will 307 yards come to?
2. If 7 yds of ſhalloon coſt 10s 6d, what will 99 yds coſt?
3. If 100 yds of ſerge coſt 5l 8s 4d, what will 37 yds coſt?
4. If 68 yds of cloth coſt 17l 19s 10d, what is 7 yds?
5. If 57 yds of linen coſt 8l 11s, what will 98 yds 3 quarters coſt?
6. If 19 lb. tobacco coſt 4l 15s, what will 3 cwt. 17 lb. coſt?
7. If 47 yds velvet coſt 34l 10s 3¼d, what will 117 yards coſt?
8. If 57 yards ſcarlet coſt 55l 4s 4½d, what will 4 pieces, each 38 yds coſt?
9. If 41 hhds of wine coſt 287l 2s 6¼d, what will 33 hhds coſt?
10. If 51 lb. Bohea coſt 19l 12s 0¾d, what will 7 caniſters, each 2 cwt. 3 qr. coſt?
11. How much tea may be bought for 7l 8s 5¼d, when 14 cwt. 3 qrs coſts 872l 16s 3d?
12. How much ſteel may be bought for 9l 16s 10½d, when 14 lb. coſt 10s 11¼d?
13. How many figs for 1l 17s 0¼d at 47l 1s 3d for 1½ ton?
14. What is a man's wages for 73 days at 37l 4s 1d *per annum*?
15. What is the price of 3 pieces of cloth, each 25 yards, at 4l 19s 11½d for 17 yards?
16. —— of 57 ell Eng. at 1l 9s 2d for 25 yards?

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* The three following queſtions are deduced from this, and every example admits of being varied in the ſame manner.

When the terms of a queſtion are ſo connected, that while one is increaſed the other increaſes, or is diminiſhed, the other diminiſhes the queſtion is ſaid to be direct. But if while the one is increaſed, the other diminiſhes, or the contrary, the queſtion is ſaid to be inverſe.—The firſt thirty examples are direct, the next eight inverſe; the others are direct and inverſe, promiſcuouſly.

17. What is the price of $7\frac{3}{5}$ ell Engliſh, at 8l 12s for 14 ell French?
18. —— of 12 pieces of cloth, each $25\frac{1}{2}$ yards at 20l 4s 8d for 47 ell Flem.
19. —— of 6 cheeſes, each $14\frac{3}{4}$ lb. at $5\frac{3}{4}$d *per* lb?
20. —— of 56 cwt. 3 qr. 14 lb. of ſugar at 15s $4\frac{1}{2}$d for 18 lb?
21. —— of 56 hhds 7 gal. of beer at 4l 6s 7d *per* hhd?
22. —— of 207 acres 15 po. of land at 26l 17s 6d *per* ac.
23. —— of 96 bar. 7 pts of ale at 36s $8\frac{1}{2}$d *per* barrel?
24. —— of 17 gal. of oil at 37l 16s *per* puncheon?
25. —— of 7 pieces of ſilver, each 4 lb. 15 dwt at 18 guineas for 72 ounces?
26. —— of 9 hhds 7 gal. wine at 4l 2s 6d for 49 gal.
27. —— of 7 cwt 3 qr. 18 lb. of ſugar at 4s $4\frac{1}{2}$d for 11 lb.
28. —— of 15 cwt. 27 lb. of tea at 3l 7s $4\frac{1}{2}$d for 7 lb.
29. —— of 3 cwt. 16 lb. of iron at 7s 1d for 17 lb.
30. —— of 56 packs of wool, each 114 ſtone, at 13l 17s $2\frac{3}{4}$ for 28 ſtone?

§31. If 42 men perform a piece of work in 108 days, in what time will 72 do it?
32. If 18 men mow a meadow in 4 days, how many will mow it in 9 days?
33. If 57 maſons finiſh a houſe in 156 days, in what time will 37 maſons do the ſame?
34. If 28 perſons reap a harveſt in 36 days how many perſons will reap it in 9 days?
35. If the 9d loaf weigh 4 lb. 6 oz. when wheat is at 4s *per* buſhel, how much ſhould it weigh when wheat is at 3s 9d?
36. If, when wheat is at 4s 6d, the 6d loaf weighs 3 lb. what is the price of the ſame quantity of wheat when it weighs 2 lb. 8 ounce 8 dwt?
37. If a garriſon of 2000 men have proviſions for 6 months, how many men will the ſame proviſions ſerve 8 months?
38. If I lend a friend 275l for 9 months, how long muſt he lend me 1925l to return the favour?

§39. If 1787 cwt. 2 qr. of lead coſt 907l 10s, what is that *per* fodder of $19\frac{1}{2}$ cwt?
40. What is ſilver *per* lb. when 4 lb. 10 oz. coſts 24l 17s 10d?
41. If a lb. of ſilver coſt 4l 16s 6d, what is the price of ſeven pieces each $3\frac{3}{4}$ lb.

42. If the ſixpence loaf weighs 3 lb. when wheat is at 34s, how much ſhould it weigh when wheat is at 1l 5s?
43. If the ſixpence loaf weigh 4 lb. 9 oz. when wheat is ſold at 1l 6s 6d, what is the price of wheat when it weighs 3 lb. 4 ounce 5⅗ dwt.
44. A bankrupt owes his creditors 4678l, how much will he pay them at 11s 6d *per* 1l?
45. How many men were in that garriſon which conſumed as much in 7 months as a garriſon of 900 men conſumed in one year and nine months?
46. A bankrupt who pays his creditors 13s 4d *per* pound pays them in all 490l, what was his debt?
47. If a garriſon of 1000 ſoldiers have proviſions for 9 months, how many muſt be diſmiſſed that the ſame proviſions may laſt 15 months?
48. If 37½ yds, yard-wide, be ſufficient to hang a room, how many yards 5 quarters wide will do it?
49. What is the tax upon a houſe, rent 340l, at 3s 6d *per* £.
50. A bankrupt who owes his creditors 960l, pays them only 504l, how much does he pay them *per* pound?
51. A garriſon has proviſions for 10 months at the rate of 16 oz. to each perſon *per* day, how much may be allowed *per* day, that the proviſions may laſt one year?
52. At 15 oz. *per* day for each man a garriſon's proviſions will laſt 8 months, how long will they laſt if each man is only allowed 12½ ounces?
53. What is the intereſt of 1750l for a year at 5 *per cent. per* annum?
54. If my commiſſion is 2½ *per cent.* what is it for 256l 18s?
55. What is the intereſt of 650l at 4l *per cent. per* annum?
56. What is the brokerage of 255l at 4s *per cent?*
57. What is the factorage of 375l at 2½l *per cent?*
58. If 425 gained 20l 3s 9d, what was the rate *per cent?*
59. What principal will gain 64l 5s 6d at 5 *per cent. per* an.
60. If 125l in 8 months gain a certain ſum of intereſt, what principal will gain the ſame in 6 months?
61. If the flooring of a room, 24 feet by 18, coſt 17l 2s, what will be the expence of flooring another 30 feet by 22?
62. How much cloth, at 7s 6d *per* yard, ought to be given in barter for 3 pieces, each 27 yds, at 5s 3d *per* yard?
63. Bought a quantity of cloth at 19l 12s 0¼d, for which I paid at the rate of 7s 8¼d *per* yard. Required how many yards were in the whole?

64. If the carriage of 169 cwt. 2 qr. for 130 miles coſt 734l, what weight may I have carried 78 miles for the ſame money?

65. Bartered 64 yards of linen at 2s 8d *per* yard, for 128 yds of cotton. Required the barter price of the latter?

66. If the carriage of 60 cwt. 120 miles be 15s 10d, how far may I have 210 cwt. carried for the ſame money?

67. A has tea worth 7s 6d ready money, but in barter will have 9s. B has cloth worth 2s 6d ready money; how muſt B rate his cloth to be even with A?

68. How many yds of cloth at 7s 6d *per* yard ought to be received for 7 pieces, each 108 yds at 5s *per* yard?

69. How much cloth, 3 qrs wide, muſt be given for 90 yds of equal goodneſs, which is 5 quarters wide?

70. A has cloth at 4s 6d *per* yd, which he wants to barter with 84 yds at 7s 6d, how many yds muſt A give?

71. The ſhadow of a cloud was obſerved to move 36 yards in 5 ſeconds, what was the hourly motion of the wind?

72. Bought 6 hhds of wine for 160l 13s, of which I loſt 42 gal. required how I muſt ſell a puncheon of the remainder, ſo as neither to gain nor loſe by it?

Note, *If the firſt term, and either of the other two, be meaſured by the ſame number; divide them by it, and uſe the quotients inſtead of them.*

73. If 24 yds of cloth coſt 36s, what will 141 yds coſt?
If 8 yards coſt 32s, what will 51 yards coſt?
If 7 lb. coſt 25s, what will 49 lb. coſt?

Compound Proportion.

In Compound Proportion, five, ſeven, *&c.* Terms are given to find a ſixth, eighth, *&c.* proportional term.

One of the terms will always be of the ſame kind as the term required. And of the others two and two will always be alike, or of the ſame kind.

Rule, 1. *To State the Terms.*

That term, which is like the term ſought, muſt be the middle term. Take of the remaining terms any two which are like.—Place the leſs firſt and greater laſt, or greater firſt and leſs laſt, according as more or leſs is required, in the ſame manner as in Simple Proportion.

Proceed thus with every remaining pair of like terms.

2. *To Reduce the Terms.*

Reduce each pair of like terms into the ſame name, and the middle term into the loweſt name in it.

3. *To find the Required Term.*

Multiply the middle term into thoſe terms which ſtand on its right hand for a dividend, and take the product of thoſe on its left for a diviſor, and the quotient will be the anſwer in the ſame name as the middle term.

1. If 100l in 12 months gain 5l intereſt, how much intereſt will 1650l gain in three years and ſix months?
2. If 100l in 365 days gain 5l intereſt, how much intereſt will 675 gain in 438 days?
3. If 15 men built 37 roods of wall in 27 days, how many roods will 74 men build in 63 days?
4. If 84 men mow 72 acres of graſs in 15 days, how many acres will 96 men mow in 12 days?
5. If 600l gain 45l in 18 months, how much will 100l gain in twelve months?
6. What is the intereſt of 650l for 173 days at 5 *per cent. per* an.
7. ——— of 375l for 37 weeks at 5 *per cent. per* annum?
8. If the intereſt of 175l for 39 weeks be 5l 18s 1½d, what is the rate *per cent. per* annum?
9. —— of 200l for 146 days be 2l 16s, required the rate *per cent. per* annum?
10. What principal will clear 88l 2s 6d in 5 years at 3¾ *per cent. per* annum?
11. How long muſt 975l be out at intereſt to gain 190l 2s 6d at 4⅓ *per cent. per* annum?
12. If 236 men eat 160 qrs of wheat in 108 days, how many quarters will 76 men eat in a year and 67 days?
13. If a man can travel 360 miles in 12 days of 8 hours each, how many miles will he travel in 60 days of 6 hours each?
14. If 24 men in 36 days, of 12 hours each, can finiſh a piece of work, in what time will 30 men accompliſh it when the days are only 8 hours long?
15. If 30 cwt be carried 15 miles for 5l 8s 9d, how many miles ought 90 cwt. to be carried for 29l?
16. If, when wheat is 10s *per* buſhel, the 9d loaf weigh 3 lb. what is the price *per* buſhel, when the penny loaf weighs nine ounces?
17. A ſolid foot of ſtone was 16 inches broad and 3 inches thick. Required its length.

18. If 18 men eat 16 ſhil. worth of bread in 3 days, when wheat is 18s *per* boll, what value of bread will 45 men eat in 27 days, when wheat is 15 ſhillings *per* boll?

19. Eight men accompliſhed 30 yds of ditching in 12 days, working 8 hours *per* day, in what time will 12 men finiſh the ſaid ditch, ſuppoſing its whole length 90 yards, when they work only ſix hours *per* day?

20. If 12 men build a wall 60 feet long 4 thick and 20 in height in 24 days, working 12 hours *per* day, what length of wall 3 feet thick and 12 high, will 18 men build in 18 days, working eight hours *per* day?

PRACTICE,

Or the method of computation by aliquot parts.

Table of Aliquot Parts.

1d = $\frac{1}{12}$ ſh.	10 ſh. = $\frac{1}{2}$l	2 ſh. = $\frac{1}{10}$l	56 lb. = $\frac{1}{2}$cwt.
$1\frac{1}{2}$ = $\frac{1}{8}$	6s 8d = $\frac{1}{3}$	1s8d = $\frac{1}{12}$	28 lb. = $\frac{1}{4}$
2 = $\frac{1}{6}$	5 - = $\frac{1}{4}$	Alſo	16 lb. = $\frac{1}{7}$
3 = $\frac{1}{4}$	4 - = $\frac{1}{5}$	1 far. = $\frac{1}{4}$d	14 lb. = $\frac{1}{8}$
4 = $\frac{1}{3}$	3 4 = $\frac{1}{6}$	1 half. = $\frac{1}{2}$	7 lb. = $\frac{1}{4}$ q.cwt
6 = $\frac{1}{2}$	2 6 = $\frac{1}{8}$		4 lb. = $\frac{1}{7}$

Rule, 1. When the price is an aliquot part of a penny, of a ſhilling, or of a pound; divide the quantity by that aliquot part; and the quotient will be the anſwer in that name which the price is an aliquot part of: Which if pence or ſhillings, reduce to pounds.

1. 74856 lb. yd. &c. at $\frac{1}{4}$d
2. 89945 at $\frac{1}{2}$d
3. 74378 at 1d
4. 74871 at $1\frac{1}{2}$d
5. 87656 at 2d
6. 785674 at 3d
7. 48746 at 4d
8. 87003 at 6d
9. 49874 at 10s
10. 78567 at 6s 8d
11. 14674 at 5s
12. 13715 at 4s
13. 68748 at 3s 4d
14. 74896 at 2s 6d
15. 78416 at 2s
16. 74168 at 1s 8d
17. 37784 at $\frac{1}{4}$
18. 16874 at 1d
19. 19648 at $\frac{1}{2}$d
20. 14638 at 3d
21. 41974 at 4d
22. 91687 at 6d
23. 71348 at $1\frac{1}{2}$
24. 14874 at 6s8d
25. 14687 at 3s4d
26. 19687 at 1s8d
27. 4694 at 5s
28. 78749 at 4s
29. 56748 at 1s8d
30. 74964 at 3s4d
31. 78914 at $\frac{1}{2}$d
32. 74864 at 2s
33. 87468 at 2d
34. 74687 at 2s6d
35. 7846 at 6s 8d
36. 91468 at 3s4d
37. 74964 at 1s 8d
38. 7468 at 4s
39. 91467 at 10s
40. 74687 at 2d
41. 41687 at 3d
42. 37146 at 4d
43. 23748 at 6d
44. 91648 at 4s

Rule, 2. When the price is a ſimple number but not an aliquot part, multiply the quantity by it; the product will be the anſwer in the ſame name as the price. Or divide it into two or more aliquot parts, work for theſe as in the laſt rule, and add the reſults.

Note, *If the price is an even number of ſhillings, multiply by half their number, and double the firſt figure of the product for ſhillings, the reſt of this product is pounds.*

1. 48469 at 5d
2. 74685 at 7d
3. 96748 at 8d
4. 49748 at 9d
5. 41634 at 10d
6. 7484 at 11d
7. 84678 at 3s
8. 41687 at 6s
9. 14896 at 7s
10. 41694 at 8s
11. 14684 at 9s
12. 96874 at 11s
13. 84674 at 12s
14. 7467 at 13s
15. 1468 at 14s
16. 7849 at 15s
17. 7464 at 16s
18. 1485 at 18s
19. 74684 at 19s
20. 89 at 36l
21. 4891 at 7l
22. 8679 at 11l
23. 148 at 13l
24. 1423 at 7d
25. 41321 at 8l
26. 48686 at 8d
27. 98444 at 9d
28. 71488 at 5d
29. 63148 at 11d
30. 14164 at 7l
31. 36568 at 6s
32. 91416 at 7s
33. 98746 at 9s
34. 34166 at 8s
35. 94468 at 10d
36. 91464 at 12s
37. 41448 at 13s
38. 67841 at 14s
39. 37482 at 15s
40. 89164 at 17s
41. 81638 at 18s
42. 81964 at 16s.

Rule, 3. When the price is a compound number, and not an aliquot part, multiply by the higheſt name, and take parts for the inferior ones; the ſum of theſe reſults is the anſwer in the ſame name as the higheſt: Or, when the price is leſs than one pound, it may be divided into two or more aliquot parts, as in the laſt rule.

1. 87495 at ¾d
2. 29165 at 1¼d
3. 17499 at 1¾d
4. 14916 at 2¼d
5. 29832 at 2½d
6. 59664 at 2¾d
7. 41968 at 3¼d
8. 20984 at 3½d
9. 93936 at 3¾d
10. 16874 at 4¼d
11. 33748 at 4½d
12. 67496 at 4¾d
13. 56874 at 5¼d
14. 28437 at 5½d
15. 43789 at 5¾d
16. 74687 at 6¼d
17. 96834 at 6½d
18. 93648 at 6¾d
19. 16890 at 7¼d
20. 33780 at 7½d
21. 67560 at 7¾d
22. 48687 at 8¼
23. 16229 at 8½d
24. 97374 at 8¾d
25. 14087 at 9¼d
26. 28174 at 9½d
27. 56348 at 9¾d
28. 14168 at 10¼d
29. 7084 at 10½d
30. 42504 at 10¾d

31. 14687 at 11¼d
32. 29374 at 11½d
33. 44061 at 11¾d
34. 89464 at 12¼d
35. 4224 at 12½d
36. 54824 at 12¼d

37. 8460 at 1s 1d
38. 7464 at 1s 2d
39. 47162 at 5s 10¼d
40. 27518 at 12s 7½d
41. 75162 at 15s 4½d
42. 61474 at 3s 11¾d
43. 30737 at 4s 6¼d
44. 16948 at 9s 8d
45. 33896 at 10s 6½d
46. 8474 at 11s 7¾d
47. 48196 at 12s 8d
48. 24098 13s 4d
49. 12049 at 15s 8½d
50. 8516 at 17s 3d
51. 6488 at 18s 6½d
52. 4678 at 19s 4¼d
53. 71486 at 3l 6s 8d
54. 89148 at 18l 3s 4d
55. 48964 at 18l 11s 6d
56. 4896 at 7l 8s 7d
57. 9164 at 3l 12s 10½d
58. 79008 at 3l 17s 8d
59. 87846 at 1l 11s 8d
60. 9878 at 2l 17s 4d

Rule, 4. When the quantity is a compound number, and the rate of the higheſt name given, multiply the price by the higheſt name, and take parts for the others.

Note, *When the quantity contains a fraction, take proportional parts of the rate for it; or, multiply the rate by the numerator, which product divide by the denominator of the fraction.*

cwt qr. lb. *£. s. d.*
1. 18 3 4 at 3 18 6 *per* cwt
2. 20 3 – at 4 17 8
3. 16 – 22 at 2 13 6
4. 15 3 18 at 4 11 9
5. 6 2 7 at 2 19 3
6. 7 3 18 at – 17 6
7. 72 3 19 at 3 17 4½
8. 175 3 22 at – 18 8
9. 16 2 — at 2 6 11
10. 48 2 7 at 74 16 6
11. — – 24 at 4 17 –
12. — – 17 at 3 5 4
13. 480 3 14 at 4 6 8
14. 774 2 8 at 3 2 6
15. 10 – 12 at 1 19 6
16. 4 lb. 6 oz. 15 dwt at 4l 7s 6d *per* lb.
17. 2 1 4 18 at 3 12 6
18. 18 1 16 5 at 4 4 6
19. 42 11 — – at – 8 11
20. 39 10 13 12 at 5 12 –
21. 86 3 15 – at 4 16 –
22. 54 7 16 – at 3 12 –
23. 72 11 10 – at 2 4 –
24. 65 10 14 – at 3 6 8½
25. 467 ac. 3 r. 38 pol. at 2l 12s *per* acre
26. 96 2 24 at 3 18 6
27. 12 3 20 at – 18 11
28. 15 2 18 at – 19 6
29. 424 feet 7 in. at 6s 8½d *p.* ft.
30. 96 feet 10 in. at 7s 6d

31.465$\frac{1}{2}$ at 4s 6d
32.167$\frac{1}{4}$ at 5s 7d
33.878$\frac{3}{4}$ at 16s 8d
34.868$\frac{3}{8}$ at 15s 6d
35.687$\frac{3}{4}$ at 4l 8s 6d
36.147$\frac{7}{12}$ at 2l 14s
37.146$\frac{8}{15}$ at 17l 8s 6d
38.964$\frac{3}{4}$ at 18s 6d
39.964$\frac{1}{4}$ at 15s 11d
40.676$\frac{2}{3}$ at 18s 9d
41.686$\frac{5}{12}$ at 18s 7d
42.996$\frac{3}{4}$ at 8l 7s 6d

Promiſcuous Exerciſes.

1. What coſts 7846 yds of ſhalloon at 11$\frac{1}{2}$d *per* yard?
2. —— 8974 acres of ground at 4l 6s *per* acre?
3. —— 8345 yds of broad cloth at 19s 11d *per* yard?
4. —— 6748 yds of demity at 2s 6d *per* yard?
5. —— 9674 yds of velvet at 14s 10d *per* yard?
6. —— 8341 acres at 4l 12s 8$\frac{1}{2}$d *per* acre?
7. —— 6834 hhds of ale at 3l 17s 11d *per* hhd?
8. —— 648 ſcore of ſheep at 6l 11s *per* ſcore?
9. —— 674 yards of ſuperfine cloth at 18s 11$\frac{1}{4}$d *per* yard?
10. —— 8341 yds of cotton at 8$\frac{3}{4}$d *per* yard?
11. —— 6874 ſets of buckles at 15s 6d *per* ſet?
12. —— 9146$\frac{1}{3}$ bolls of wheat at 15s 6$\frac{1}{2}$d *per* boll?
13. —— 3918 yards of brown cloth at 12s 6d *per* yard?
14. —— 56 cwt 18 lb. of tea at 34l 12s *per* cwt?
15. —— 37 cwt 20 lb. 12 oz. of ſugar at 3l 8s *per* cwt?
16. —— 3 lb. 11 oz. 10 dwt. of ſilver ſpoons at 4l 12s 6d *per* lb.
17. —— 86 lb. 3 oz. 15 dwt. 18 grains of ſilver-plate at 4l 16s 4d *per* lb.
18. —— 145 acres 3 r. 15 pol. of paſture at 18l 6s *per* ac.
19. —— 95 ac. 2 r. 18 pol. of graſs at 37l 15s 8d *per* acre?
20. —— 4571$\frac{5}{6}$ yds ſuperfine cloth at 18s 11$\frac{1}{2}$d *per* yard?

Note, *The* groſs weight *of goods, is the weight of both goods and packages* Tare *is an allowance made the purchaſer for the package.* Trett *is an allowance of* 4 *lb. on* 104 *lb. or* $\frac{1}{26}$ *on goods liable to waſte.* Cloff *is an allowance of* 2 *lb. on* 3 *cwt. or* $\frac{1}{168}$ *for the turn of the ſcale. The remainder, when farther allowances are to be made, is called* ſuttle; *when all allowances are made, it is called* nett weight.

21. What is the nett weight of 468 cwt. 3 qrs. 16 lb. tare 14 lb. *per* cwt?
22. —— of 315 cwt. 2 qr. 21 lb. tare 16 lb. *per* cwt?
23. —— of 896 cwt. 1 qr. 14 lb. tare 8 lb. *per* cwt?

24. What is the nett weight of 786 cwt 3 qrs 21 lb. tare 24 lb. *per* cwt?
25. —— of 336 cwt 3 qrs 14 lb. tare 21 lb. *per* cwt?
26. —— of 448 cwt 14 lb. tare 19 lb. *per* cwt?
27. —— of 3 caſks, each 22 cwt 2 quarters 15 lb. tare 18 lb. *per* cwt?
28. —— of 5 caſks, each 73 cwt. 16 lb. tare 25 lb. *per* cwt?
29. —— of 12 barrels of figs, each 2 cwt 2 qrs. tare 14 lb. *per* cwt?
30. —— of 27 hhds ſugar, each 6 cwt 14 lb. tare 16 lb. *per* cwt?
31. —— of 134 cwt 2 qrs 16 lb. tare 24 lb. *per* cwt?
32. —— of 37 bags of coffee, each 4 cwt 18 lb. tare 13 lb. *per* cwt?
33. What is the trett on 317 cwt 12 lb.
34. —— on 28 cwt 3 qrs 4 lb.
35. —— on 24 bags coffee, each 3 cwt 16 lb.
36. —— on 96 cwt 3 quarters 14 lb.
37. What is the cloff on 85 cwt 2 quarters?
38. —— on 54 cwt 2 quarters?
39. —— on 39 cwt 2 quarters?
40. What is the nett weight of 6786 cwt 2 qrs, tare 18 lb. *per* cwt, deducting alſo trett and cloff?
41. —— of 7 cheſts of tea, each 16 cwt 3 qrs 16 lb. tare 20 lb. *per* cwt. allowing alſo trett and cloff?
42. —— of 5 caſks of ſugar, each 13 cwt 24 lb. tare 12 lb. *per* cwt, deducting alſo trett and cloff?

Bills of Parcels, and Bills on Book Debts.

Mr John Adams

1790. Bought of James Mercer.

March 8. 8 yards of ſilk at 13s 8d *per* yard
7 yards of ſatin at 12s 10d
11 yards of rich brocade at 18s 10½d
12 yards of flowered ſilk at 15s 11d
9 yards of ſarcenet at 4s 3d
16 yards velvet at 25s 10s

£. ______

Mr John Wills, Dr.

1790. To Henry Hoſier.

May 8.	To	9 pair worſted ſtockings at	4s	9d *per* pair.	
		7 pair thread ditto	3	5	
		8 pair ſilk ditto	13	10	
		12 pair cotton ditto	5	8	
		18 yards fine flannel	2	3 *per* yard	
		27 ditto ditto	1	9	
					£.

3. May 4. 1790. Mr John Vyſe bought of Jacob Draper 27 yards fine ſerge at 3s 11d *per* yard, 17 yds drugget at 7s 10d, 19 yards ſcarlet at 21s *per* yard, 13 yds broad cloth at 17s 11d, 29 yards drab at 13s 9d, 19 yards ſhalloon at 1s 9d

4. Auguſt 10. 1790. Mr Philip Norie bought of Peter Grocer 27½ lb. of green tea at 17s 6d *per* lb. 17¾ imperial ditto at 23s 4d, 44¾ lb. bohea at 12s 9d, 18½ ditto at 7s 8d, 37 lb. ſugar at 13½d, 11 ſugar loaves, each 15¼ lb. at 8¼d.

5. May 7. 1790. Mr James Scott bought of John Pen 34 reams thick poſt at 33s *per* ream, 27 thin ditto at 23s, 16 ditto foolſcape 19s, 130 ditto printing demy 15s 6d, 8 ditto ſuperfine royal 43s, 27 ditto cartridge 14s 6d, 7 cwt paſteboards 17s 6d *per* cwt.

May 8. 1790. Mr F. Todd, Dr. to Geo. Grant,

6. To 36 yards ſuperfine cloth 22s *per* yard; 5 pieces ſatin, each 20 yds at 14s 6d; 7 pieces ditto, each 30 yds at 12s 3d; 5 pieces luſtring, each 18 yards at 7s 6d; 28 yds ſilk at 14s; 3 pieces damaſk, each 30 yards at 10s 6d; 53 yds ſilk at 7s 4d.

7. Edinburgh September 3. 1789. Mr James Freeman bought of Simon Stewart 40 pieces of calicoes, 30 yards each at 2s 4d *per* yard; 21 pieces, each 27½ yds at 3s 8d; 25 pieces, each 26 yds at 2s 7½d; 16 pieces, each 25 yds at 2s 2½d; 17 pieces, each 29 yards at 2s 3¼d; 2 pieces, each 27½ yds at 4s 2d; 53 yds at 7s 6d.

8. 1790. March 11. Mr John Jolly bought of Samuel Draper 34 pieces of oſnaburghs, each 37 yds at 8½d *per* yard;

49 pieces of Iriſh linen, each 25 yds at 1s $7\frac{1}{2}$d; 33 pieces checks, each $30\frac{3}{4}$ yds at 15d; 62 pieces ſtripped linen, each $25\frac{1}{2}$ yds at 4s $6\frac{1}{2}$d; 20 pieces holland, each 26 yds at 2s $8\frac{1}{2}$d; 34 pieces ſheeting, each 64 yds at 1s $3\frac{3}{4}$d; 27 pieces of flowered cloth, each $39\frac{1}{2}$ yards at 3s $10\frac{1}{2}$d.

9. 1789. Auguſt 7. Mr Thomas Thomſon bought of S. Linnen 57 yards of cambrics at 5s $7\frac{3}{4}$d *per* yard, 61 ditto at 8s $5\frac{1}{4}$d, 79 ells Eng. of lawn at 8s $7\frac{1}{2}$d *per* yard, 107 ell Flem. of lace at 3s $8\frac{1}{4}$d *per* yd, 95 ells French of lawn at 15s 7d *per* yard, 56 yards linen at 3s $4\frac{1}{2}$d, 75 yds ditto at 6s $3\frac{1}{4}$d, 98 yds broad cloth at 17s 8d.

10. 1789. April 4. Mr James Retail Dr. to Tho. Manners. To plain linen 550 yds at 2s $8\frac{3}{4}$d *per* yard, ſtripped 654 yards 2s $8\frac{1}{3}$d, flowered ditto 780 yards 13s $4\frac{1}{2}$d, ſprigged ditto 660 yds 7s $8\frac{3}{4}$d, cambrics 950 yds 7s $8\frac{1}{5}$d, ſtripped ditto 460 yds 13s $4\frac{1}{4}$d, flowered ditto 468 yds 7s $8\frac{1}{2}$d, ſilk gauzes 860 yds 3s $11\frac{1}{4}$d.

11. Mr Joſeph Smith bought of Mr John Laſt 74 dozen pair mens ſhoes 47s $3\frac{3}{4}$d *per* dozen, 69 ditto 48s $7\frac{1}{2}$d, 55 ditto pumps 57s $6\frac{1}{4}$d, 86 pair womens ſhoes 45s $11\frac{1}{4}$d, 98 ditto 48s $6\frac{1}{2}$d, 79 ditto pumps 49s $6\frac{1}{4}$d, 107 childrens ſhoes 35s $8\frac{1}{2}$d, 193 ditto pumps 39s $10\frac{1}{2}$d.

12. 1790. March 38. Mr Robert Rice bought of Geo. Price 7 hhds ſugar, each 9 cwt 3 qr. 27 lb. at 27s *per* cwt; raiſins 5 bar. each 2 cwt. 1 qr. 8 lb. at 35s; pepér 7 bags, each $2\frac{1}{2}$ cwt 17 lb. at 7l 10s; prunes 5 caſks, each 35 cwt 3 qrs 18 lb. at 24s; ginger 7 bags, each 4 cwt 3 qrs 17 lb. at 35s; currants $3\frac{1}{2}$ butts, each 17 cwt 2 qrs at 47s; 3 hhds tobacco, each 3 cwt 18 lb. at 25l 4s; ſnuff 7 canniſters each $25\frac{1}{2}$ lb. at 3l 14s 8d; rice 8 bar. at 19s *per* bar.; clover-ſeed 7 bags, each 250 lb. at $5\frac{1}{2}$d *per* lb.

13. 1790. March 19. Mr Richard Robbins bought of James Nivan, 5 caſks of tea, each 3 cwt. 1 qr. 18 lb. at 39l 4s *per* cwt; 3 caſks of coffee, each 4 cwt 3 qrs 27 lb. at 29l 8s; 67 cwt 3 qrs 26 lb. of iron at 16s 8d; 7 hhds ſugar, each 8 cwt 27 lb. at 3l 6 8d; 5 puncheons rum at 7s $3\frac{1}{2}$d *per* gal. $113\frac{1}{2}$ gal. brandy at 8s $2\frac{1}{2}$d, 117 gal. gin at 4s 9d, 57 cwt 25 lb. raiſins at 6l 12s 8d *per* cwt, 3 cwt 17 lb. prunes at 1s 2d *per* lb. 118 lb. figs at 2l 19s 8d *per* cwt.

14. 1791. January 8. Mr J. Campbell Dr. to Wil. Currie. To 13 cwt 1 qr 14 lb. ginger at 4l 13s *per* cwt, 7 cwt 2 qrs 27 lb. pymento at 3l 18s, 3 hhds logwood, each 4 cwt 3 qrs 27 lb. at 14s 6d, 115 cwt 1 qr 19 lb. allum at 18s 4d, 35 cwt 27 lb. iron at 17l 19s, 375 qrs 5 buſh. corn at 33s 8d *per* qr. 15 lb. 3 oz. 20 grs ſilver at 5s 2d *per* oz. 21 bags of wool, each 196 lb. at 1s 3d *per* lb.; intereſt of 520l for 15 months at 5 *per cent. per annum*, 4 hhds linſeed at 57s 6d *per* hogſhead.

VULGAR FRACTIONS.

1. A fraction is a part of an unit, or any thing conſidered as a whole, and always ſuppoſes the unit or whole, divided into ſome number of equal parts. It is expreſſed by two numbers, or terms; the one called the Numerator placed above, and the other called the Denominator placed below, a ſhort line thus, 3 numerator.
   4 denominator.
2. The denominator ſhews into how many parts the unit is divided; the numerator expreſſes the number of theſe parts which the fraction contains.
3. And, becauſe the whole is always equal to the ſum of all its parts, fractions will be leſs, equal to, or greater than unity, according as the numerator is leſs, equal to, or greater than the denominator; the firſt of theſe is called a proper fraction, the others improper ones.
4. A ſimple fraction has but one numerator and denominator as $\frac{3}{4}$, a compound one is compoſed of two or more ſimple ones connected by the word of, as $\frac{1}{2}$ of $\frac{3}{4}$.
5. A mixed number is one partly whole, partly fractional, as $4\frac{1}{4}$.
6. If the terms of a fraction are equally multiplied, or divided, its value is not thereby altered.

REDUCTION.

Prob. 1ſt. To reduce fractions to their loweſt terms; divide both terms by their greateſt common meaſure, which is found thus: Divide the greater term by the leſs, and the diviſor by the remainder continually, till nothing remains. The laſt diviſor is the greateſt common meaſure.

Reduce $\frac{176}{484}$, $\frac{48}{160}$, $\frac{7845}{96780}$, $\frac{8664}{8986}$, $\frac{740}{8675}$, $\frac{764}{5240}$, $\frac{644}{1728}$, $\frac{768}{1024}$, $\frac{3360}{4032}$, to their loweſt terms.

Note, *The common meaſure may often be found by inſpection, thus* $\frac{4}{16}$ *is manifeſtly diviſible by* 4. Note alſo, *That an even number is diviſible by* 2; *and a number ending with* 5 *or* 0, *is diviſible by* 5.

Prob. 2*d*. To reduce mixed numbers to improper fractions; multiply the integer by the denominator adding the numerator, under this ſum write the denominator.

Reduce $4\frac{3}{8}$, $6\frac{1}{3}$, $14\frac{1}{4}$, $15\frac{3}{7}$, $12\frac{5}{8}$, $7\frac{1}{2}$, $11\frac{1}{7}$, $13\frac{1}{5}$, to improper fractions.

Prob. 3. To reduce improper fractions to whole or mixed numbers; divide the numerator by the denominator.

Reduce $\frac{35}{8}$, $\frac{19}{3}$, $\frac{57}{4}$, $\frac{108}{7}$, $\frac{101}{8}$, $\frac{15}{2}$, $\frac{78}{7}$, $\frac{66}{5}$, to mixed numbers.

Prob. 4. To reduce compound fractions to ſimple ones; multiply all the numerators together for the numerator, and all the denominators together for the denominator of the ſimple fraction.

Reduce $\frac{3}{8}$ of $\frac{4}{15}$, and $\frac{3}{7}$ of $\frac{5}{8}$ of $\frac{1}{6}$, and $\frac{4}{7}$ of $\frac{5}{12}$ of 6, and $\frac{3}{5}$ of $\frac{12}{19}$, and $\frac{6}{11}$ of $\frac{5}{8}$ to ſimple fractions.

Prob. 5. To reduce fractions to others of equal value, having a common denominator; multiply each numerator into all the denominators, except its own, for a new numerator; and multiply all the denominators together, for the common denominator.

1. Reduce $\frac{7}{8}$ and $\frac{5}{6}$ to a common denominator.
2. $\frac{1}{2}$, $\frac{1}{3}$, $\frac{3}{4}$. 3. $\frac{5}{6}$, $\frac{7}{8}$, $\frac{8}{9}$, $\frac{9}{10}$. 4. $\frac{7}{11}$, $\frac{8}{9}$, $\frac{6}{13}$. 5. $\frac{8}{15}$, $\frac{12}{17}$, $\frac{9}{11}$. 6. $\frac{4}{15}$, $\frac{11}{12}$, $\frac{3}{13}$, $\frac{1}{11}$. 7. $\frac{4}{5}$, $\frac{3}{7}$, $\frac{13}{15}$, $\frac{16}{17}$. 8. $\frac{1}{2}$ of $\frac{3}{4}$, $\frac{5}{6}$ of $\frac{2}{3}$, $\frac{3}{5}$ of $\frac{1}{4}$.

Prob. 6. To reduce fractions from one denomination to another; if from a lower to a higher, multiply the denominator by the number of the lower that makes one of the higher: If from a higher to a lower, multiply the numerator thereby.

1. Reduce $\frac{4}{9}$ of a far. to the fraction of a pound.
2. —— $\frac{4}{5}$ ſh. — guinea.
3. —— $\frac{9}{11}$ ſh. — moidore.
4. —— $\frac{5}{12}$ crown — pound.
5. —— $\frac{4}{7}$ far. — ſhil.
6. —— $\frac{2}{3}$ h. cr. — pound.
7. —— $\frac{7}{8}$ penny — guin.
8. —— $\frac{5}{7}$ lb. — ton.
9. —— $\frac{8}{9}$ oz. — cwt.
10. —— $\frac{4}{5}$ dram — lb.
11. —— $\frac{9}{11}$ yard — mile.
12. —— $\frac{12}{13}$ ſec. — hour.

1. Reduce $\frac{1}{2160}$ ₤. to the fract. of a farth.
2. —— $\frac{4}{105}$ guin. — ſhil.
3. —— $\frac{1}{33}$ moid. — ſhil.
4. —— $\frac{5}{48}$ pound — crown.
5. —— $\frac{1}{84}$ ſhil. — farthing.
6. —— $\frac{1}{12}$ pound — h. cro.
7. —— $\frac{1}{288}$ guin. — penny
8. —— $\frac{1}{3136}$ ton — lb.
9. —— $\frac{1}{2016}$ cwt — ounce.
10. —— $\frac{1}{326}$ lb. — dram.
11. —— $\frac{9}{19360}$ mile — yd.
12. —— $\frac{1}{3960}$ hour. — ſec.

1. Reduce $\frac{4}{5}$ ₤. to the fraction of a guinea.
2. —— $\frac{7}{8}$ crown — moidore.
3. —— $\frac{3}{4}$ pound — joan.
4. —— $\frac{3}{5}$ yd — ell Eng.
5. —— $\frac{2}{3}$ ell Fl. — ell Eng.
6. —— $\frac{4}{9}$ crown — guinea.

1. Reduce $\frac{16}{21}$ guin. to the fraction of a pound.
2. —— $\frac{35}{216}$ moid. — crown.
3. —— $\frac{5}{12}$ joannes — pound.
4. —— $\frac{12}{25}$ ell Eng. — yard.
5. —— $\frac{2}{5}$ ell Eng. — ell Fl.
6. —— $\frac{20}{189}$ guin. — crown.

Note, *In queſtions ſuch as the following, reduce the given quantity to the loweſt name in it for the numerator, and reduce the denomination it is required to be reduced to, into the ſame name for the denominator.*

1. Reduce 7d to the fraction of a pound.
2. —— $4\frac{1}{2}$ — ſhilling.
3. —— $9\frac{3}{4}$ — guinea
4. —— 19 8d — pound
5. —— 7 $8\frac{1}{2}$d — pound
6. —— 4 lb. 3 dr. — cwt
7. —— $7\frac{3}{4}$ dram — lb. av.
8. —— 8 dwt $17\frac{1}{5}$ gr. – lb. tr.
9. —— 7 gal. $3\frac{1}{5}$ pts – hd wi.
10. —— 5 days 3 hours 17 min. — year
11. —— 5 yds $2\frac{1}{5}$ ft — mil.
12. —— 3 ro. 5 p. — acre

13. Reduce 7 fur. 4 poles to the fraction of a mile
14. —— $8\frac{3}{4}$d — crown
15. —— 6 $10\frac{1}{2}$d — half-gui.
16. —— 13 lb. 4 oz. — ton
17. —— 7 dwt 13 qrs — oz.
18. —— 8 gal. 7 pts — hd be.
19. —— 17 gallons 5 pints — hhd ale
20. —— 3 buſh. 3 pks — qr
21. —— 5 oz. 7 grs — lb. troy
22. —— 2 r. 17 p. — acre
23. —— 24 ſeconds — hour
24. —— 15 h. 15 min. — day

Prob. 7. To find the value of a fraction; reduce the numerator into the next inferior name; and divide by the denominator. Reduce the remainder into the next lower name; and divide again and ſo on, as far as neceſſary.

What is the value of

1. $\frac{7}{240}$ pound?
2. $\frac{3}{8}$ ſhilling?
3. $\frac{13}{330}$ guinea?
4. $\frac{59}{60}$ pound?
5. $\frac{37}{90}$ pound?
6. $\frac{1027}{28672}$ cwt?
7. $\frac{31}{1024}$ lb. av.
8. $\frac{523}{14400}$ lb. tr.
9. $\frac{37}{315}$ hhds wine?
10. $\frac{7397}{525600}$ year?
11. $\frac{43}{13200}$ mile?
12. $\frac{25}{32}$ acre?
13. $\frac{71}{80}$ mile?
14. $\frac{7}{48}$ crown?
15. $\frac{55}{84}$ half-guinea?
16. $\frac{53}{8960}$ ton?
17. $\frac{181}{480}$ ounce troy?
18. $\frac{71}{432}$ hdd beer?
19. $\frac{47}{128}$ hhd ale?
20. $\frac{15}{32}$ quarter?
21. $\frac{2407}{5760}$ lb. troy?
22. $\frac{97}{100}$ acre?
23. $\frac{1}{150}$ hour?
24. $\frac{61}{96}$ day?

ADDITION.

Rule, Reduce the fractions to a common denominator; add the numerators, and under their ſum write the common denominator.

1. $\frac{7}{8}+\frac{9}{13}+\frac{6}{7}$
2. $\frac{5}{11}+\frac{6}{11}+\frac{8}{11}$
3. $\frac{3}{17}+\frac{4}{9}+\frac{1}{5}+\frac{6}{19}$
4. $\frac{24}{37}+\frac{13}{23}+\frac{14}{17}$
5. $\frac{3}{5}$ of $\frac{7}{8}+\frac{8}{11}$ of $\frac{1}{2}$
6. $\frac{13}{23}+\frac{11}{18}+\frac{10}{11}$
7. $\frac{7}{8}+\frac{14}{15}+\frac{13}{27}+\frac{1}{2}$ of $\frac{5}{8}$
8. $\frac{4}{7}$ of $\frac{7}{11}+\frac{12}{17}+\frac{13}{19}$
9. $\frac{7}{5}$ of $\frac{12}{13}+\frac{8}{9}$ of $\frac{11}{19}$

Note, 1. *When mixed numbers are given, find the ſum of the fractions as before; to which add the integers.*

10. $4\frac{1}{2}+7\frac{1}{3}+8\frac{4}{5}$. 11. $9\frac{1}{4}+6+8+11\frac{1}{3}$. 12. $\frac{7}{8}+6\frac{3}{11}+14\frac{1}{3}+51\frac{3}{4}$

2. When fractions are of different names, reduce them into the ſame name, by Prob. 6. and add as before; or find their value by Prob. 7. and add as in Compound Addition.

13. $\frac{7}{8}$ ſh.$+\frac{4}{11}$ pound
14. $\frac{3}{4}$ ſh.$+\frac{5}{8}$ pound$+\frac{6}{7}$ guin.
15. $\frac{1}{4}$ lb.$+\frac{1}{7}$ oz.$+\frac{3}{5}$ dwt
16. $\frac{3}{8}$ cr.$+\frac{5}{12}$ pound$+\frac{8}{15}$ gui.
17. $\frac{7}{12}$ ſh.$+\frac{13}{14}$l.$+\frac{15}{18}$ joan.
18. $\frac{5}{8}$ yd$+\frac{3}{5}$ ell En.$+\frac{2}{3}$ ell Fl.
19. $\frac{3}{5}$d$+\frac{5}{8}$s$+\frac{5}{7}$l$+\frac{7}{8}$ moid.
20. $\frac{1}{3}$ lb.$+\frac{3}{5}$ cwt$+\frac{5}{8}$ ton
21. $\frac{3}{5}$ qr.$+\frac{2}{3}$ buſh.$+\frac{3}{5}$ peck
22. $\frac{3}{5}$ h.$+\frac{5}{12}$ day$+\frac{4}{7}$ week.

23. A borrowed at one time $84\frac{7}{11}$l, at another time $17\frac{5}{7}$l, at another $18\frac{5}{8}$s, at another time $11\frac{3}{8}$d; how much did A borrow in all?

24. B went to market and bought of tea $4\frac{3}{7}$ cwt$+18\frac{7}{8}$ lb.$+28\frac{13}{14}$ lb.$+13\frac{3}{4}$oz. how much did he buy in all?

25. C went to market and ſold of cloth $54\frac{1}{8}$ yard$+16\frac{7}{8}$ yard $+30\frac{1}{5}$ ell Eng.$+4\frac{2}{3}$ ell Fl. how many yards did he ſell in all?

SUBTRACTION.

Rule, Having reduced the fractions, as in Addition, find the difference of the numerators; under which, write the common denominator.

Note, *In mixed numbers, if the numerator of the fraction in the ſubtrahend exceed that in the minuend, ſubtract it from the common denominator; and add one to the units place of the ſubtrahend.*

1. $\frac{4}{5}-\frac{5}{12}$
2. $\frac{13}{18}-\frac{5}{16}$
3. $\frac{8}{11}-\frac{3}{17}$ of $\frac{1}{2}$
4. $\frac{24}{25}-\frac{15}{49}$
5. $\frac{11}{54}-\frac{3}{28}$ of $\frac{5}{6}$
6. $\frac{9}{11}-\frac{1}{13}$ of 4
7. $6\frac{1}{8}-4\frac{3}{4}$
8. $7\frac{5}{12}-3\frac{1}{2}$
9. $8\frac{1}{2}-4\frac{1}{4}$
10. $15-\frac{3}{7}$
11. $18-5\frac{3}{8}$
12. $13\frac{7}{8}-4\frac{4}{5}$
13. $\frac{7}{11}$l $-\frac{7}{12}$ ſh.
14. $\frac{13}{15}$l $-\frac{4}{7}$ crown
15. $\frac{8}{9}$ joannes $-\frac{7}{11}$ guin.$+\frac{2}{5}$ pound.

16. Paid a debt of $7\frac{4}{11}$ pound, out of a purſe containing $9\frac{1}{12}$ guineas; how much remained?

17. A's ſhare of a ſhip was $\frac{27}{38}$, of which he ſold $\frac{3}{4}$; how much remained?

18. A perſon who had $13\frac{5}{8}$ yds of cloth, ſold $7\frac{3}{4}$ yds; how much remained?

19. What part of a ſhip remained after ſelling $\frac{4}{7}$ of $\frac{5}{8}+\frac{1}{3}$ of $\frac{3}{7}$?

20. Sold $\frac{3}{8}$ of $\frac{5}{6}+\frac{2}{3}$ of $\frac{3}{7}$ of a hhd of wine; how much remained?

MULTIPLICATION.

Rule, Multiply all the numerators together for the numerator of the product; and all the denominators together for its denominator.

1. $\frac{4}{5}\times\frac{11}{12}$
2. $\frac{4}{13}\times\frac{4}{27}$
3. $\frac{12}{37}\times\frac{18}{43}$
4. $\frac{7}{11}\times\frac{8}{9}$ of $\frac{3}{5}$
5. $\frac{5}{8}$ of $\frac{7}{11}\times\frac{9}{11}$
6. $8\times\frac{5}{7}$
7. $8\frac{3}{4}\times\frac{5}{12}$
8. $7\times\frac{5}{13}$
9. $16\times\frac{3}{4}$
10. $5\frac{3}{8}\times 11\frac{1}{4}$
11. $18\frac{3}{16}\times 11\frac{3}{4}$
12. $3\frac{5}{8}\times 4\frac{5}{6}$

13. What is the value of $\frac{5}{8}$ yards of cloth at $\frac{17}{18}$ pound *per* yard?
14. —— of $\frac{3}{7}$ acre at $2\frac{3}{11}$ pound *per* acre?
15. —— of $17\frac{5}{11}$ yds at $7\frac{5}{18}$ ſh. *per* yard?
16. —— of $37\frac{3}{5}$ ell Engliſh at $5\frac{3}{7}$d *per* yard?
17. —— of $\frac{5}{7}$ oz. of ſilver at $3\frac{5}{8}$l *per* lb.
18. —— of $60\frac{3}{5}$ gal. wine at $50\frac{4}{5}$l *per* ton?

DIVISION.

Rule, Invert the diviſor, and proceed as in Multiplication.

1. $\frac{11}{12})\frac{11}{15}$
2. $\frac{4}{27})\frac{16}{351}$
3. $\frac{18}{43})\frac{216}{1591}$
4. $\frac{8}{9}$ of $\frac{3}{5})\frac{56}{165}$
5. $\frac{9}{11})\frac{315}{968}$
6. $\frac{5}{7})5\frac{5}{7}$
7. $\frac{5}{12})3\frac{31}{48}$
8. $\frac{5}{13})2\frac{9}{13}$
9. $\frac{3}{4})12$
10. $11\frac{1}{4})60\frac{15}{32}$
11. $11\frac{3}{4})213\frac{45}{64}$
12. $4\frac{5}{6})17\frac{25}{48}$

13. If $7\frac{5}{7}$ yds of lawn coſt $38\frac{7}{8}$s, what is the price *per* yd?
14. A farm of $17\frac{3}{11}$ acres was rented at $14\frac{7}{15}$l. what was the rent *per* acre?
15. What is cloth *per* yard when 7 pieces, each $11\frac{3}{5}$ yards, coſt $54\frac{3}{8}$ pound?
16. A man performed a piece of work in $6\frac{13}{18}$ days, what part of the work did he perform in one day?
17. How many ſtones, each $13\frac{4}{5}$ inches by $7\frac{1}{4}$, will lay a kitchen $40\frac{7}{8}$ feet long, and $32\frac{3}{4}$ broad?
18. Divide a ſhip of $980\frac{7}{11}$l value into $21\frac{3}{7}$ ſhares, and a prize of 1000l value into $42\frac{5}{8}$ ſhares.

PROPORTION.

Rule, State the terms as in integers; and multiply and divide, as directed above.

1. If $\frac{3}{5}$ yds coſt $\frac{7}{18}$ pound, what coſt $4\frac{3}{4}$ yards?
2. What is the price of $5\frac{3}{7}$ yds velvet at 7s 6d for $\frac{3}{4}$ yds?
3. What coſts $\frac{7}{12}$ lb. of tea at 15s $8\frac{1}{2}$d for $3\frac{5}{7}$ lbs?
4. What coſts 8 cwt 3 qrs at 14s 8d for $\frac{7}{9}$ cwt?

5. What coſts $15\frac{5}{8}$ yds of ſilk at 8s 9d *per* yard ?
6. What coſts $17\frac{3}{4}$ yards at 11s 8d for $5\frac{1}{5}$ ell Engliſh ?
7. What coſts 3 cheſts of tea, each 3 cwt 14 lb. at 5s 7d for $1\frac{1}{8}$ lb. ?
8. If the value of $\frac{4}{7}$ ſhip is 920l, what will $\frac{3}{5}$ of $\frac{1}{3}$ come to ?
9. The rent of $\frac{13}{14}$ of a meadow was 3l 12s, what will be the rent of $\frac{8}{9}$ of $\frac{7}{13}$ at that rate ?
10. How many yards of cloth, at 8s 4d *per* yard, muſt be given for 44 ell Engliſh 3 qrs, at 10s 6d *per* ell ?
11. The height of my ſtaff, from the ground, is 5 feet 10 inches ; and it caſts a ſhadow of 6 feet 5 inches ; what is the height of a ſteeple, which caſts a ſhadow of 220 feet 6 inches ?
12. If $\frac{7}{11}$ of a houſe coſt 360l, what will $\frac{17}{24}$ of the ſame come to ?
13. A lends B $454\frac{3}{5}$l for $6\frac{1}{8}$ month, how long muſt B lend A $204\frac{3}{5}$l to diſcharge the obligation ?
14. If, when wheat is 5s, the $2\frac{1}{2}$d loaf weighs $8\frac{2}{5}$ oz. what ought the 6d loaf to weigh when wheat is 8s 3d ?
15. A can do a piece of work in 18 days, B the ſame in 20 days, C in 24 days ; in what time will they perform it, working together ?

Promiſcuous Exerciſes.

1. The number 12 may be expreſſed by a certain digit, repeated four times ; ſo may alſo the numbers 23, 34, 45, &c. &c. by certain other digits. Quere the digits, and manner of placing them ?
2. The number 10 may be expreſſed by a certain digit repeated thrice ; the number 100 by the ſame digit repeated four times ; the number 1000 by the ſame digit repeated five times, and ſo on, *ad infinitum.* Quere as before ?
3. A jeweller bought 3 pieces of ſilver—1*ſt*, weighing $3\frac{7}{8}$ lb. 2*d*. $11\frac{5}{6}$ ounce. 3*d*. $17\frac{3}{8}$ dwt. what did he pay for the whole, at $5\frac{7}{12}$l *per* lb.
4. A ſhipowner ſold $\frac{1}{4}$ of $\frac{3}{5}$ of a veſſel to one perſon, and $\frac{6}{7}$ of $\frac{5}{9}$, to another perſon. Required what part he had remaining ?
5. From a caſk, containing a puncheon of wine, there was drawn $\frac{3}{8}$ hhd+$\frac{3}{7}$ hhd+$\frac{4}{5}$ hhd ; how much remained ?

6. What is the difference between $\frac{3}{4}$ of a buſhel, and $\frac{7}{11}$ of a peck; alſo between $\frac{1}{5}$ of a gal. and $\frac{13}{14}$ of a pint?
7. What is the weight of a box of goods $4\frac{1}{4}$ feet long $3\frac{3}{8}$ feet broad $21\frac{7}{12}$ in. thick, and weighing $4\frac{3}{4}$ lb. *per* ſolid foot?
8. What is the price of a piece of wainſcot $7\frac{1}{8}$ feet in length, $23\frac{5}{12}$ inches in breadth, at $17\frac{3}{5}$d *per* foot ſquare?
9. A lady's fortune was $\frac{4}{5}$ of $\frac{7}{8}$ of her brother's, which was valued at 3000l. Quere the lady's fortune?
10. Divide $876\frac{3}{7}$l into $11\frac{3}{5}$ ſhares.
11. Divide $78\frac{2}{5}$l among 4 men and two women, ſo that the men have equal ſhares, and the women $\frac{1}{3}$ of a ſhare each.
12. A perſon having $\frac{2}{3}$ of a copper mine, ſells $\frac{3}{5}$ of his ſhare for 396l, what was the whole mine worth?
13. What is the price of a ſilver tea-pot weighing $1\frac{2}{7}$ lb. at $\frac{5}{8}$l *per* $1\frac{5}{7}$ ounce?
14. What is the price of $13\frac{1}{2}$ oz. ſilver at 52l 16s for $18\frac{6}{7}$ lb.
15. If cloth, when $\frac{5}{8}$ wide, coſts $3\frac{5}{6}$s, what is the price of the ſame cloth when $\frac{9}{8}$ wide?
16. If $27\frac{1}{2}$ yards of cloth $\frac{13}{12}$ yard wide coſt 10l 13s 4d, what will $7\frac{3}{4}$ yds coſt, when only $\frac{11}{12}$ yd wide?
17. How many yds of paper $\frac{3}{4}$ yd broad will line a room 24 feet 8 inches long, 18 feet 11 inches broad, and 11 feet 2 inches high?
18. If 13 yds of cloth, $\frac{3}{4}$ yd wide, coſt 5 guineas; how much cloth of the ſame goodneſs, may be bought for 8l 12s, when $\frac{2}{3}$ ell Eng. wide?
19. A bankrupt's effects amount to $\frac{3}{5}$ of his debts, what is that *per* pound?
20. A ſhepherd being aſked the number of his ſheep and goats, anſwered that $\frac{1}{2}+\frac{1}{4}+\frac{1}{5}+\frac{1}{8}+\frac{1}{10}+\frac{1}{20}+\frac{1}{40}$ of the number of my ſheep is to that of my goats as 5 to 1; and $\frac{1}{2}+\frac{1}{4}+\frac{1}{5}+\frac{1}{10}+\frac{1}{20}$ of my goats is equal to 110. Required the number of his ſheep and goats?
21. A can perform a piece of work in 9 hours, B in $8\frac{1}{2}$, and C in $6\frac{3}{4}$; in what time can they perform it all working together?
22. A, B, and C, working together, can finiſh a piece of work in 8 days; which A can do by himſelf in 25 days, and B in 22; in what time could C do it?

DECIMAL FRACTIONS.

1. Decimal Fractions are ſuch as have for their denominator an unit, with as many cyphers as there are figures in the numerator; and therefore, having any numerator given, its denominator is thence known; and ſo is always omitted; and the numerators only wrote down, with a point prefixed to diſtinguiſh them from integers; whence they may be worked along with, and in the ſame manner, generally ſpeaking, as whole numbers *.

2. The way of reading decimal fractions will be manifeſt; for, by the above notation $\cdot 2 = \frac{2}{10}$, or two tenths; $\cdot 23 = \frac{23}{100}$, or two tenths three hundredth parts; $\cdot 234 = \frac{234}{1000}$, or two hundred and thirty-four thouſandth parts; $\cdot 03 = \frac{3}{100}$, or three hundredth parts; and ſo of others.

3. If a vulgar fraction can be reduced to a decimal, without leaving a remainder; the decimal is called *finite*, or *terminate*; if not, the decimal is called *infinite*, or *interminate*.

4. Interminate decimals may be diſtinguiſhed into, *1ſt*, Repeating decimals, when the ſame figure is continually repeated. *2d*, Circulating decimals, when two or more figures continually repeat. *3d*, If they repeat, or circulate from the beginning, they are called pure repeaters, or circulates; if not, they ate called mixed ones.

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* *Or, decimal fractions may be conceived to ariſe from the continuation of the common notation ſcale, beyond unity, towards the right hand; for then the numbers will* decreaſe *in a decimal or tenfold proportion, in the ſame manner as they* increaſe *in that proportion, when continued towards the left hand.*

Here we may obſerve, 1. *That the ſcale taken, in this enlarged point of view, conſiſts of two branches; the one, containing integers, may be conſidered as its poſitive, or increaſing branch; the other, containing decimals as its negative, or decreaſing branch.* 2. *That unity is the common point or term, where the increaſe and decreaſe commences; and that the value of the* places *depends wholly on their diſtance from unity* 3. *That cyphers, placed on the left hand of decimals, decreaſe their value; becauſe they are thereby removed farther from unity; but that their value is not affected by cyphers placed on the right hand, becauſe their diſtance from unity is not thereby altered.*

ADDITION AND SUBTRACTION.

Rule, Place like names under like names, which is readily done by placing the decimal points under each other; then proceed as in integers.

1. 478·63+89·005+5437·25+·000125+91·75+541.2375.
2. 6·75+89·5+·00009+.502+7·548.
3. 51·416+915·13+·04751+·005819+·000045+·01018.
4. 74·874+81·33486+·0974+1.0718+88·71034.
5. 61·371568+·0091+·06371+·0008714+43·814.
6. 71·48—35·71, 87·31—6·871496, 3·187—1·00007, ·67·48—·377, 1·000009—·784163, 4·001—·374, and ·00078—·000089.

MULTIPLICATION.

Rule, Proceed as in integers; and point off as many decimals in the product, as there are in both factors. If the product has not ſo many, ſupply the defect by prefixing cyphers.

1. 74869·3×·673
2. 8914·714×6·7
3. 71·807×·0009
4. ·0714×·013
5. 91·07×·03
6. 58·62×·$\dot{3}$
7. 74·58×·083
8. ·987×·642
9. ·078×·004
10. 478×·038
11. 748×·$\dot{6}$
12. 891×·$\dot{7}$2

Note, *To multiply by an unit with cyphers, remove the decimal point, at many places, towards the right hand, as there are cyphers.*

13. 78·14×10. 14. ·98516×10000. 15. 6·87146×1000000.

DIVISION.

Proceed as in integers, and point the quotient, ſo as that there may be as many decimal places in the diviſor and quotient together, as in the dividend.

Note, 1. *In caſe of a remainder, the quotient may be carried to any degree of exactneſs, by annexing cyphers in terminate decimals; and the repeating, or circulating figures in interminates.*

Note, 2. *To divide by an unit with cyphers; remove the decimal point as many places towards the left hand as there are cyphers.*

1. ·11)1·4641
2. ·8204)·504020944
3. 23·15)1836·88305
4. 53·146)22118.6052122
5. ·01548)·04888501956
6. ·8416591)·0030266061236
7. ·25)784689·5
8. ·75)87486·125
9. ·00785)·8741685
10. 33·85)37416·556
11. ·785)18
12. 1000)7486·35

REDUCTION.

Prob. 1. To reduce a vulgar fraction to a decimal; divide the numerator, with as many cyphers annexed as neceſſary, by the denominator.

1. Reduce $\frac{1}{8}$ to a decimal.
2. $\frac{5}{8}$.
3. $\frac{1}{2}$.
4. $\frac{1}{4}$.
5. $\frac{3}{4}$.
6. $\frac{7}{8}$.
7. $\frac{1}{3}$.
8. $\frac{1}{9}$.
9. $\frac{5}{6}$.
10. $\frac{1}{6}$.
11. $\frac{9}{16}$.
12. $\frac{1}{5}$.
13. $\frac{1}{75}$.
14. $\frac{1}{1875}$.
15. $\frac{7}{11}$.
16. $\frac{8}{11}$.
17. $\frac{4}{9}$.
18. $\frac{9}{11}$.
19. $\frac{1}{7}$.
20. $\frac{3}{11}$.
21. $\frac{1}{13}$.
22. $\frac{1}{99}$.
23. $\frac{11}{54}$.
24. $\frac{2}{3}$.
25. $\frac{16}{17}$.

Prob. 2. To reduce a decimal to a vulgar fraction; the given decimal will be the numerator, and an unit with as many cyphers annexed as there are figures in the decimal will be the denominator of the required fraction, which reduce to its loweſt terms.

1. Reduce ·5 to a vulgar fraction.
2. ·25.
3. ·75.
4. ·125.
5. ·625.
6. ·34.
7. ·375.
8. ·005.
9. ·078.

Note, *If the decimal be a pure repeater, put the repeating figure for the numerator, and 9 for the denominator: If a pure circulate, put the circulating figures for the numerator, and as many 9's for the denominator: If the decimal have cyphers prefixed, annex as many to the 9's in the denominator: If the decimal be mixed, ſubtract the finite part from the whole decimal; the remainder is the* *numerator, and as many 9's as there are places in the circle, with as many cyphers annexed as there are figures in the finite part will be the denominator.*

1. Ruduce $\cdot\dot{6}$, $\cdot\dot{8}1$, $\dot{0}9$, $\cdot 8\dot{3}$, and $\dot{8}12$. to vulgar fractions.

2. $\cdot\dot{2}4$.
3. $\cdot 14\dot{3}$.
4. $\cdot 15\dot{2}4$.
5. $\cdot\dot{3}85$.
6. $\cdot 7\dot{6}$.
7. $4\dot{8}$.
8. $6\dot{7}8$.
9. $\cdot\dot{4}13$
10. $\cdot\dot{3}$.
11. $\cdot 7\dot{3}$.
12. $54\dot{6}32$.

Prob. 3. To reduce numbers of a lower name to the decimal of a higher; if the given number be ſimple, divide it by the value of the higheſt, annexing as many cyphers as neceſſary; if a compound number, reduce the loweſt part to a decimal of the next higher name, prefixing the given part of that name; reduce the number thus obtained to a decimal of the next higher name, and ſo on, as far as required.

1. Reduce 9d to the decimal of a pound.
2. 10d — pound
3. 17s 6d — pound
4. 12s $8\frac{1}{4}$d — pound
5. 19s $11\frac{3}{4}$d — pound
6. 14s $3\frac{1}{2}$d — pound
7. 3s 4d — pound
8. 6s 8d — pound
9. 13s 4d — pound
10. 11d — pound
11. $4\frac{1}{2}$d — pound
12. $\frac{3}{4}$d — pound
13. Reduce 7 lb. to the decimal of a cwt
14. —— 8 lb. — cwt
15. —— 17 lb. — ton
16. —— 18 cwt 13 lb.— ton
17. —— 11 oz. 17 dwt — lb.
18. —— 13 dwt 16 grs — lb.
19. Reduce 5 dwt 12 grs. to the decimal of an oz.
20. —— 7 oz. 14 drs — cwt
21. —— 10 oz. 12 drs — lb.
22. —— 3 oz. 14 dwt 8 grs — lb.
23. —— 3 quarters — yd
24. —— 1 qr 2 nail — yard
25. —— 6 fur. 5 pol. — mile
26. —— 2 ro. 11 per. — ac.
27. —— 10 in. 8 parts — foot
28. —— 11d — ſhilling
29. —— 10d — ſhilling
30. —— $7\frac{1}{2}$d — ſhil.
31. —— 12s $4\frac{3}{4}$d — guin.
32. —— 2 hd 55 g. wi. — ton
33. —— 5 yd 2 ft 11 in.—pol.
34. —— 7 days 6 h. — year
35. —— 7 h. 9 min. — day
36. —— 22 minutes 3 ſeconds — hour.

Prob. 4. To find the value of a decimal in parts of the integer; multiply it by the number of times the integer contains the next lower name, and point off as many decimals from the product towards the right hand as there are in the given decimal; the figures on the left hand are integers of ſaid lower name; reduce the figures pointed off into the next lower name, and point off as before. Proceed thus as far as neceſſary.

1. What is the value of ·0375l
2. —— $\cdot 041\dot{6}$l
3. —— ·875l
4. —— ·634375l
5. —— $\cdot 998958\dot{3}$l
6. —— $\cdot 71458\dot{3}$l
7. —— $\cdot 1\dot{6}$l
8. —— $\cdot \dot{3}$l
9. —— $\cdot \dot{6}$l
10. —— $\cdot 0458\dot{3}$l
11. —— ·01875
12. —— ·003125l
13. —— ·0625 cwt
14. —— ·071428 cwt
15. —— ·007589 ton
16. —— ·9058 ton
17. —— ·9875 lb troy
18. —— $\cdot 0569\dot{4}$ ditto
19. What is the value of ·275 oz. troy
20. —— ·004394 cwt
21. —— ·671875 lb. av.
22. —— $3097\dot{2}$ lb. troy
23. —— ·75 yard
24. —— ·375 yard
25. —— ·765625 mile
26. —— ·56875 acre
27. —— $\dot{8}$ foot
28. —— $91\dot{6}$ ſhilling
29. —— $\cdot 8\dot{3}$ ſhilling
30. —— ·625 ſhillings
31. —— $\cdot 5902\dot{7}$ guinea
32. —— ·718253 ton
33. —— $1\cdot 0\dot{8}5$ pole
34. —— ·019863 year
35. —— ·2979 day
36. —— ·3675 hour.

CONTRACTIONS.

I. To multiply decimals, and retain no more decimals in the product than is thought neceſſary.

Rule, Invert the multiplier, and make the units figure ſtand under that place of decimals you want to retain in the product; then begin each line of product by the multiplication of that figure in the multiplicand which ſtands over the figure you are multiplying by, including the carriage from the right hand place, and write down the products ſo that their right hand figures ſtand under each other.——Extend the product one place farther than is wanted, becauſe of the uncertainty of the laſt figure.

1. Multiply ·874 by ·375, and retain 4 decimal places in the product.
2. Multiply ·879 by 4·21, and retain three places.
3. Multiply 6·714 by ·4678, and retain 4 decimal places.

II. To contract diviſion; having found the firſt figure of the product in the common way, for each after figure, divide the laſt remainder, omitting a figure at each ſtep on the right hand of the diviſor, but including the carriage.

1. ·2465)·5789648.
2. ·4873)·9146856.
3. ·6738)·8964896.
4. ·3785)·87468678.

III. To reduce ſhillings, pence, and farthings, to decimals of a pound ſterling of three places.

Rule, Take half the number of ſhillings for the firſt decimal place; and the number of the farthings in the remainder increaſed by 1 if it amounts to 24, or upwards; by 2 if it amounts to 48, or upwards; and by 3 if to 72, or upwards; for the two next places.

1. 8s 8½d
2. 7s 4¼d
3. 9s 6¾d
4. 14s 8¼d
5. 13s 5½d
6. 17s 9¾d
7. 4l 10s 6d
8. 3l 8s 7d
9. 4l 6s 8½d
10. 7l 15s 8¾d
11. 2l 13s 1½d
12. 3l 16s 8¼d

IV. To value decimals of a pound ſterling.

Rule, Double the firſt decimal place, and if the ſecond be 5, or upwards, add one thereto for ſhillings; then divide the ſecond and third places, or their exceſs above 50 by 4, firſt deducting 1 if it amount to 25, or upwards. The quotient is pence, and the remainder farthings.

1. ·4481
2. ·3251
3. 2·5361
4. ·678
5. ·904
6. ·817
7. 4·981
8. 6·743
9. 4.998
10. ·799
11. ·867
12. ·874

The practical queſtions given under the ſeveral rules in vulgar fractions may now be worked decimally.

INTEREST.

Intereſt is the allowance given by the borrower to the lender for the uſe of his money. The amount of any ſum is the principal, with the intereſt added to it.

Rule, To compute intereſt at 5 *per cent.* for any number of days *; multiply the principal by the number of days, and divide the product by 7300 †. To compute intereſt at any other rate; multiply the intereſt at 5 *per cent.* found as above, by the given rate, and divide the product by 5.

Note, *In computing intereſt for days the 29th of February is not reckoned; nor is the day computed from reckoned, but the day computed to is.*

1. Required the intereſt of 3204l 14s at 5 *per cent.* for 37 days.
2. —— of 789l for 36 days, at ditto
3. —— of 910l 15s for 27 days, at ditto
4. —— of 874l for 68 days, at ditto
5. —— of 608l 6s 8d for 58 days, at 4 *per cent.*
6. —— of 780 for 257 days, at 3 *per cent.*
7. —— of 850 for 308 days, at 4½ *per cent.*
8. —— of 260 from May 7. to Sept. 12. at 4 *per cent.*
9. —— of 150l from Jan. 7. to Auguſt 23. at 4¾ *per cent.*
10. —— of 630 from Sept. 12. to Jan. 27. at 4¼ *per cent.*

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* This method of computing intereſt for days is more adapted to practice, than that formerly ſhewn by Componnd Proportion.

† The ſum multiplied by the number of days, gives the intereſt for an equal number of years in ſhillings; this divided by 365 and 20, or 7300 gives the anſwer for the number of days in pounds.

11. Required the intereſt of 720l from March 8. to June 7. at 3 *per cent.*

12. —— of 230l from May 27. to September 18. at $3\frac{1}{2}$ *per cent.*

When ſeveral partial payments are made at different times, multiply the principal and ſeveral balances into the number of days they are at intereſt; divide the ſum of theſe products by 7300 for the intereſt at 5 *per cent.*

13. A bill of 500l was due March 12. of which 150l was paid April 7; 200l June 28.; and the balance Sept. 15. Required how much intereſt is due?

14. Required the intereſt on a bill of 456l due May 7. of which 120l was paid June 18. 116l Sept. 27. 136l Nov. 17.; and the balance December 27?

15. Required the intereſt on a bill of 1000l due March 13. of which 300l was paid April 7; 234l May 13; 230l July 28; and the balance October 18?

16. Required the intereſt of a bill of 900l due Jan. 1, of which 150l was paid February 29; 270l March 30; 173l June 19; 213l July 28; 57l September 23; and the balance November 17?

17. Borrowed March 20. 1789. 1000l. of which I paid 300l September 17; 150l December 21; 220l February 23. 1790: I am to pay up the balance July 23. How much will then be due principal and intereſt?

18. Lent January 20. 1788. 2000l. of which I received, April 7, 350l; September 28, 690l; December 18, 420l: I am to receive the balance April 7. How much will then be due, principal and intereſt?

In computing intereſt on accompts current, add and ſubtract the ſums paid and received, in the order of their dates; and if the balance be ſometimes due to the one party, and ſometimes to the other; extend the products in different columns.

19. Required the intereſt on the following accompt, at 5 *per cent.*?

Dr. Mr Dinſdale his accompt cur. with W. F. and Co. Cr.

Jan. 7.	To balance	210l	April 14.	By caſh	130l
Mar. 7.	To caſh	150	June 27.	By caſh	215
May 8.	To caſh	240	Aug. 13.	By caſh	167
July 21.	To caſh	300	Oct. 12.	By caſh	280
Sep. 18.	To caſh	250	Nov. 18.	By caſh	120
Dec. 24.	To caſh	160			

On the following accompt, at 4 *per cent.*

20. Dr. S. M. and Co. their accompt current with N. M. Cr.

May 1.	To balance	250l	June 8.	By caſh	124l
June 28.	To caſh	140	July 19.	By caſh	230
Aug. 11.	To caſh	340	Oct. 20.	By caſh	150
Nov. 12.	To caſh	221	Dec. 12.	By caſh	200

Required the intereſt on the following accompt, at 5 *per cent.*

21. Dr. M. N. his accompt current with W. H. Cr.

Jan. 1.	To caſh	120l	Jan. 17.	By caſh	200l
Mar. 18.	To caſh	180	July 7.	By caſh	60
Aug. 24.	To caſh	320	Sep. 14.	By caſh	400
Oct. 8.	To caſh	250			

22. Required the intereſt on the following accompt to November 30.; allowing 5 *per cent.* when the balance is due to A, B; and 4 *per cent.* when due to R. S.?

Dr. Mr A. B. his account current with R. S. Cr.

Dec. 7.	To balance	103l	Mar. 13.	By caſh	354l
Feb. 13.	To caſh	118	June 3.	By caſh	275
Apr. 28.	To caſh	400	Aug. 17.	By caſh	100
Sept. 5.	To caſh	350	Nov. 18.	By caſh	255

23. On the following accompt, to Feb. 21. allowing T. M. 5 *per cent.* and G. H. 4 ditto?

Dr. G. H. his accompt current with T. M. and Co. Cr.

June 8.	To balance	107l	Aug. 7.	By caſh	400l
July 25.	To caſh	230	Oct. 3.	By caſh	220
Sep. 7.	To caſh	321	Dec. 27.	By caſh	180
Nov. 21.	To caſh	161			
Dec. 23.	To caſh	140			

24. On the following accompt, allowing F. R. 5 *per cent.* and R. C. 4 ditto?

Dr. F. R. his account current with R. C. Cr.

March 8.	To balance	80l	June 18.	By caſh	172l
July 4.	To caſh	74	Sep. 23.	——	98
Oct. 29.	——	108	Nov. 15.	——	148
Dec. 17.	——	217	Feb. 28.	——	150
Jan. 18.	——	135			

When partial payments are made, on bonds or bills, at intervals greater than a year; add the intereſt, at the times of payment, to the principal; and from that amount, deduct the payment.

25. Lent on bond, June 1. 1786. the ſum of 750l, at 5 *per cent.* of which I received, October 8. 1787, 180l; January 1. 1789, 360l; the balance is to be paid Auguſt 14. 1790. Required how much I have then to receive?

26. Borrowed on bond, March 18. 1785, 600l; of which I paid, July 27. 1786, 250l; November 17. 1787, 225l; February 24. 1788, 175l: I paid the balance May 30. 1789. How much did it amount to?

27. Lent to A. B. on bond, Jan. 1. 1787, 1000l; of which I received as follows: May 25. 1788, 400l; September 3. 1789, 350l; the balance is to be paid February 24. 1791. How much will I then receive?

DISCOUNT.

To find the preſent worth of any ſum due any time hence; or, to find what diſcount ought to be allowed for receiving preſent payment of a ſum due ſome time hence.

Rule, *To compute the preſent worth.*

As the amount of 100l, for the given rate and time : to 100l. : : ſo is the debt : to the preſent worth.

Rule, *To compute the diſcount.*

As the amount of 100l for the given rate and time : to the intereſt of 100l for the ſame, : : ſo is the debt : to the diſcount.

1. What is the preſent worth of 350l due 146 days hence?
2. —— of 225l, due 60 days hence?
3. —— of 212l 10s, due 73 days hence?
4. Required the diſcount of 410l, due 55 days hence?
5. —— of 150l, due 80 days hence?
6. —— of 220l due 125 days hence?
7. What ready money will pay a debt of 1875l, due 79 days hence?
8. What ready money will diſcount a bill of 1000l, due in 285 days?

EQUATION OF PAYMENTS.

To find the time when two or more debts, due at as many different times, may be paid at once.

Rule, Multiply each debt by the time which has to run before it be due. The ſum of theſe products, divided by the ſum of the debts, will quote the equated time nearly.

1. I owe 60l in 40 days, 80l in 60 days, and 120l in 108 days; when ought the whole to be paid?
2. I owe 74l in 50 days, 108l in 250 days, and 100l in a year; required the equated time for paying the whole?
3. 240l is to be paid as follows: 60l in 60 days, 80l in 96 days, 40l in 250 days, and the reſt in a year and 35 days; required the equated time for paying the whole together.

COMPOUND INTEREST is computed by making the amount at each term of payment, the principal for the next term.

Or, by the following

RULE, Find the amount of 1l for a year, and raiſe it to a power; the index of which is the number of years.

Then, 1l : this amount :: given principal : its amount.

1. If 400l be put out to compound intereſt for 3 years, at 5 *per cent*. what will the intereſt and amount be?
2. Required the intereſt and amount of the ſame, for the ſame time at 4 *per cent.*?
3. Required the amount of 200l for 4 years, at 5 *per cent. per annum*?

PARTNERSHIP.

To divide the profits and loſſes of merchants in company, in proportion to the ſhares of the capital, or ſtock; or to divide a number into parts, having the ſame proportion as certain other numbers.

Rule, As the whole ſtock, : to each particular ſtock : : So is the whole gain or loſs : to the reſpective ſhares of it. Or, as the ſum of the numbers : to each particular number : : So is the number to be divided : to the required parts.

1. Divide the number 120 into three ſuch parts which ſhall be as 3, 4, 5.
2. Divide 960 into parts, having the ſame proportion as 1, 3, 5.
3. Three men, A, B, C, make a joint ſtock; A's ſhare is 64l, B's 88l, C's 96l; they continue in trade until their profits are 108l; required their ſhares?
4. Four merchants freight a ſhip to Barbadoes, value of the cargo 1260l, whereof A's ſhare is 540l, B's 360l, C's 240l, and D's the reſt; they gain 220l: required each man's ſhare of it?
5. M, N, and P, make a joint adventure to Jamaica; M's ſhare of the adventure is 230l, N's 324l, P's 336l; they loſe 144l; required the loſs of each?
6. B's ſhare is 940l, C's 560l, D's 840l; they loſe 240l; required their ſhares of the loſs?
7. A, B, and C, continue in trade for a year, with a ſtock of 1200l; at the end of which A's gain was 40l, B's 64l, C's 56l; required their ſtocks?
8. A quantity of common, conſiſting of 240 acres, is to be divided amongſt L, M, and N, in proportion to their eſtates; L's eſtate is 400l a year, M's 350l, N's 200l; what is each man's ſhare of the common?

Note, *When the times of their continuing their ſtock in company are unequal, their reſpective ſtocks muſt be multiplied by their reſpective times.*

9. A's ſtock of 250l was three months in trade, B's of 960l was two months, and C's of 540l was ſix months in trade; they gained 480l; required their ſhares?

10. A, B, and C, had a joint ſtock of 630l; A's continued only 3 months, B's 5 months, and C's a year: Alſo, A's ſtock was 215l, B's 310l, and C's the reſt; they gained 254l; required their ſhares?

11. A and B enter into partnerſhip for a year, A with 200l, B with 160l; after four months they admit C with 120l, at the end of the year their gain is 150l; what is each man's ſhare thereof.

12. A, B, and C, enter into company, A puts in 600l, at the end of 8 months he withdraws 200l; B puts in 400l, and at ſix months end puts in 200l more; C puts in 300l, at the end of 4 months puts in 400l more; but at the end of 10 months takes out 200l; they clear 360l; required their ſhares?

13. Three graziers rent a graſs field at 30l: A puts in 40 oxen for 4 months, B 60 oxen for 3 months, and C 20 oxen for the reſt of the year; what part of the rent ought each to pay?

14. A advances next year 12l, and puts in 30 oxen; B pays 10l for 40 oxen; and C the reſt for 25 oxen: required the time the oxen of each continued at graſs?

PROFIT AND LOSS.

I. Given the prime coſt, and the profit, or loſs upon it; or, which is the ſame thing, the difference between it and the ſelling price, to compute the profit or loſs *per cent.*

Rule, As the prime coſt : to the profit or loſs on it :: ſo is 100 : to profit or loſs *per cent.*

1. Bought cloth at 3s 8d, and ſold it at 4d *per* yard profit, what was the gain *per cent.*?

2. Sold cloth of 15s *per* yard value, at 1s 6d *per* yard loſs, what was the loſs *per cent.*?

3. Bought cloth at 9s 6d *per* yard, and ſold it at 12s, what was the gain *per cent.*?

4. Bought tea at 5s 6d *per* lb. but getting damaged, I was obliged to ſell it at 4s 9d, what was the loſs *per cent.*?

5. Bought 7 cwt 3 qrs of ſugar at 5$\frac{1}{4}$d *per* lb. and ſold it at 9d, what did I gain *per cent.* and how much upon the whole?

6. How much *per cent.* is 2$\frac{1}{2}$d *per* ſhilling?

7. Bought a houſe for 315l, paid for repairs 20l, and ſold it for 400l; what was the gain *per cent.*?

II. Given the rate *per cent.* and prime coſt to find the ſelling price.

Rule, As 100 : to 100 with the rate *per cent.* added to it in caſe of gain, or deducted in caſe of loſs : : ſo is the prime coſt : to the ſelling price.

8. Gained $9\frac{1}{11}$ *per cent.* by cloth which I bought at 3s 8d, what did I ſell it at?
9. Loſt 10 *per cent.* by cloth which I bought at 15s, what did I ſell it at?
10. Bought cloth at 9s 6d, at what muſt I ſell it to gain $26\frac{6}{19}$ *per cent.*?
11. I bought tea at 5s 6d, but getting damaged am obliged to loſe $13\frac{7}{11}$ *per cent.* by it, what muſt I ſell it at to loſe ſo much?
12. Bought ſugar at $5\frac{1}{4}$ *per* lb. at what muſt I ſell it *per* lb. to gain $56\frac{12}{23}$ *per cent.* by it?
13. Bought coffee at 4s *per* lb. at what muſt I ſell it *per* lb. to gain $20\frac{5}{6}$ *per cent.*?

III. Given the rate *per cent.* and ſelling price, to find the prime coſt.

Rule, As 100 with the rate *per cent.* added, or deducted : to 100 : : ſo is the ſelling price : to the prime coſt.

14. If I gain $9\frac{1}{11}$ *per cent.* on cloth I ſold at 4s, what was the prime coſt?
15. Loſt 10 *per cent.* on cloth which I ſold at 13s 6d, what was the prime coſt?
16. Loſt $13\frac{7}{11}$ *per cent.* by ſelling tea at 4s 9d, what was the prime coſt?
17. Gained $56\frac{12}{23}$ *per cent.* by ſelling goods at 9d, what was the prime coſt?
18. Sold a quantity of cloth at 4s 10d *per* yard, by which I cleared $20\frac{5}{6}$ *per cent.* what did I buy it for?
19. Sold cloth at 12s, on which I gained $26\frac{6}{19}$ *per cent.* what was the prime coſt?

IV. Given two ſelling prices and the rate *per cent.* in proportion to one of them, to find the rate *per cent.* correſponding to the other.

Rule, As the price whoſe rate *per cent.* is given : to 100, with the given rate added or deducted, : : ſo is the other given price : to a fourth number, from which ſubtract 100 in caſe of gain; but which ſubtract from 100 in caſe of loſs. The remainder will be the required rate.

20. By ſelling cloth at 5s, I gained 12 *per cent.* what did I gain, *per cent.* by ſelling at 6s?
21. By ſelling goods at 8s, I loſt 14 *per cent.* what did I loſe by ſelling at 7s 6d?
22. Sold goods at 15s 6d, whereby I cleared 18 *per cent.*; but the commodity turning ſcarce, I ſold what remained at 16s 4d; what did I clear, *per cent.* by the latter price?
23. By ſelling tea at 5s 3d, I gained 16 *per cent.* the ſame tea was afterwards ſold at 4s 6d, what was loſt or gained, *per cent.* by the laſt price?

PROMISCUOUS EXERCISES.

1. Bought cambric at 4s 3d *per* yard, and ſold it at 5s 8d *per* ell Eng. what was gained, or loſt in 4 pieces, each 15 yards, and how much *per cent.*?
2. Bought goods at 6s 3d *per* quarter, and ſold them at 1l 18s 6d *per* cwt; what was gained in 27 cwt, and how much *per cent.*?
3. Bought cloth at 15s *per* yard, how muſt it be ſold, *per* yd, to gain 3l 6s 8d by 80 yards, and what will be the gain *per cent.*?
4. Bought a caſk of rum, containing 3 puncheons, at 8s 6d *per* gallon, but having loſt 24 gal. by leakage, I want to know at what I muſt ſell the remainder *per* gallon, ſo as to make up the prime coſt of the whole.
5. If 17 cwt 3 qrs of ſugar be bought for 49l 14s, and retailed at 9½ *per* lb. what was gained on the whole, and how much *per cent.*?
6. A merchant ſold 4 cwt 3 qrs of tea at 136l 8s, whereby he gained 10 *per cent.* what was the prime coſt *per* lb.?

7. Bought hops at 5 guineas *per* cwt, how muſt they be ſold *per* lb. to gain 15 *per cent.?*
8. By ſelling cloth at 17s 6d, I cleared 8 *per cent.* how much did I clear, *per cent.* by ſelling the ſame cloth at 18s 3d?
9. Bought 69 gallons brandy, and 57 gal. rum, all at 8s 6d; the brandy is ſold at 10s 2d; at what muſt the rum be ſold to gain 20 *per cent.* on the whole?
10. If I gain 10l *per cent.* by ſelling at 2d *per* lb. what do I gain, or loſe, *per cent.* by ſelling at 1$\frac{3}{4}$d *per* lb.?
11. Sold 33 pipes of wine at 410l 0s 6d, whereby I gained as much as I ſold 3 pipes for, what was my gain *per cent.*
12. A merchant imported 11 pipes of wine, which coſt him thirty guineas *per* pipe, and which were bottled into 52 dozen each; bottles, and other charge 2s 4d *per* dozen; he ſold one half of it at 16s 2d *per* dozen; the other half he ſold at 17s *per* dozen. What did he gain, or loſe, upon the whole?
13. A maltſter purchaſes 400 chaldrons of barley at 5l 10s *per* chal. he pays malt-houſe rent 25l, ſervants wages 60l, duty 10$\frac{1}{4}$d *per* buſhel; the malt is ſold at 3s 10d *per* buſhel, and ſuppoſing he had 40 buſhel malt for each chaldron of barley, what was the gain, or loſs, on the whole, and how much *per cent.?*
14. Shipped on an adventure to Liſbon 300 barrels of ſalmon at 3l 18s 6d, 450 yards of linen at 2s 7d, 1200 yds broad cloth at 16s, inſurance and charges of ſhipping 44l 8s 6d; the nett proceeds, as *per* account of ſales, was 2440l 16s 4d. Required the gain, or loſs, and how much *per cent.?*
15. Shipped for Bourdeaux 1200 qrs of wheat at 39s 6d, 600 qrs of barley at 25s 6d, 400 yds of cloth at 15s, inſurance on 1800l at 3 guineas *per cent.* policy 10s 6d, commiſſion and other charges 18l 10s; the nett proceeds was 3618l 14s 6d. Required the gain, or loſs, and how much *per cent.?*
16. Sold a quantity of cloth at 3s 3d *per* yard, by which I gained 12l. and 8$\frac{1}{3}$ *per cent.* required the quantity ſold, and the prime coſt?
17. Bought quills at 15s, which I ſold at 1l 0s 4d, and four months credit, required the gain *per cent.?*
18. Bought paper at 12s, at what muſt I ſell it, and give 6 months credit, to gain 10 *per cent.?*

19. What will I gain, or loſe, *per cent.* by ſelling tea at 5s 4d *per* lb. and 8 months credit, for which I paid 25l *per* cwt a year ago?

EXCHANGE OF MONEY.

Exchange teaches to find what ſum of the money of one country is equal to any given ſum of another, according to a given courſe of exchange. The *par* of the money of one nation compared with that of another, (being always according to their intrinſic value) is fixed. But the *courſe of exchange*, being the preſent value allowed for money of one country when reduced to that of another, varies upon different occaſions.

In ſome places money is diſtinguiſhed into bank and current: The former is more valuable than the latter; and their difference is called *Agio*. Accompts are kept in the latter, and bills of exchange are generally tranſacted in the former.

The computations may be performed by Proportion, or by Practice.

I. Ireland. Accompts are kept in pounds, ſhillings, and pence Iriſh, which are inferior to ſterling.

Exchange with Britain is upon the 100l ſterling, which at par is equal to 108l 6s 8d Iriſh.

1. What ſterling is equal to 972l Iriſh, exchange 108l?
2. What Iriſh is equal to 385l ſterling, exchange 109?
3. London remits to Dublin 450l 15s ſterling, for how much Iriſh muſt London be credited, ex. 107?
4. Dublin draws on Britain for 836l 10s, how much ſterling will pay the bill, exchange 112?

II. British America. Accompts are kept in pounds, ſhillings, and pence currency, whoſe value is very fluctuating; but is always inferior to ſterling.

Exchange with Britain, at ſo many pounds currency *per* 100l ſterling.

1. How much ſterling for 672l currency, exchange 140l?
2. How much Jamaica cur. for 444l 9s ſter. ex. 135?

3. How much ſterling in 1413l currency of New York, exchange 152l?
4. How much currency of Barbadoes in 8246l ſterling, exchange 140?

III. Holland. Accompts are kept in florins, or guilders, ſtivers, and pennings.

Exchange with Britain is from 34 to 37s groſs, or flemiſh, *per* pound ſterling; *par* is 36s 7d current; *agio* varies from 2 to 5 *per cent.*

To turn banco into currency, and the contrary, ſay

$$100 : 100 + \text{agio} :: \text{banco} : \text{currency}.$$
$$100 + \text{agio} : 100 :: \text{currency} : \text{banco}.$$

16 pennings = 1 ſtiver.
20 ſtivers = 1 guilder.
2 guilders = 1 dollar.
$2\frac{1}{2}$ guilders = 1 rixdol.
$5\frac{1}{4}$ guilders = 1 ducat

2 pence groſs = 1 ſtiver.
40 pence groſs = 1 guilder.
12 pence groſs = 1 ſchilling.
20 ſchil. groſs = 1 pound gr. or flemiſh.

1. How many guilders current in 48750 g. banco agio $4\frac{3}{4}$?
2. How many guild. banco in 7864 g. cur. agio $2\frac{1}{4}$?
3. How much ſterling in 7846 guild. banco, ex. 34s 6d?
4. How many guilders in 4850l ſterling, ex. 36s 6d?
5. How much ſter. in 854l flemiſh, ex. 35s 6d?
6. How many pound flemiſh in 648l ſter. ex. 36s 3d?
7. How much ſterling in 7860 guilders current agio $2\frac{3}{4}$, exchange 35s 2d?
8. How many guild. cur. in 4050l ſter. ex. 35s 6d agio 3?
9. What is the value of the guild. banco, ex. 36s 6d?
10. What is the value of the guilder current, ex. 36s 7d agio 4?
11. In 6789l 15s ſterling, how many pounds flemiſh, exchange 35s 6d?
12. In 7968l 10s flemiſh, how much ſter. ex. 34s 8d?
13. Britain draws on Amſterdam for 895l 15s ſterling, how much Flemiſh will pay the draught, ex. 35s 6d?
14. Britain remits Amſterdam 4896 guild. 15 ſtivers, how much ſterling will pay the bill, ex. 35s 4d?

IV. Germany, *Hamburgh.* Accompts are kept in marcs, and ſhilling-lubs. The agio varies from 15 to 25 *per cent.*

Exchange with Britain is by ſo many ſhillings and pence groſs, *per* pound ſterling.

Exchange with Holland about 33 ſtivers banco *per* dollar of Hamburgh.

12 phennings = 1 ſchil. lubs
16 ſchil. lubs = 1 marc lubs
2 marcs = 1 dollar
3 marcs = 1 rix dollar
6¼ marcs = 1 ducat

6 phenn. = 1 pen. groſs.
2 pen. gr. = 1 ſchil. lubs.
6 ſch. lubs = 1 ſchil. groſs.
32 pen. gr. = 1 marc lubs
120 ſch. lubs, or 7½ marcs = 1l groſs.

1. How much ſter. in 269600 marc lubs banco, ex. 33s 4d?
2. How many ml. in 96481 ſter. ex. 33s 10d?
3. How many ml. in 8468 guild. ex. 33½?
4. How many guild. in 4968 ml. ex. 32¼?
5. How much ſter. in 13284 ml. cur. agio 20, ex. 33s 10d?
6. How many ml. current in 482l ex. 33s 4d, agio 15?
7. How many ml. current in 4892 guild. current, agio in Holland 3, ex. 32¾, agio in Hamburgh 18½?
8. How many current guild. in 4500 ml. current, agio in Hamburgh 25, ex. 32, agio in Hol. 4?
9. How many ml. cur. in 21528 g. cur. agio in Hol. 3½, ex. 32½, agio in Hamburgh 18½?

V. France. Accompts are kept in livres, ſols, and deniers.

12 deniers = 1 ſol
20 ſols = 1 livre

3 livres = 1 ecu or crown
24 livres = 1 louis d'or.

Exchange with Britain at from 28 to 34d *per* crown, par 29¼.
——— Holland about 28 ſtivers banco *per* crown.
——— Hamburgh about 26 ſh. lubs *per* crown.

1. How much ſterling in 480 livres, ex. 30½?
2. How many livres in 96l ſterling, ex. 32?
3. How many guild. in 480 livres, ex. 28½?
4. How many livres in 4680 guild. ex. 27½?
5. How many cur. guild. in 8964 livres, ex. 27½, agio 3½?
6. In 76844 g. current, how much French, agio 3, ex. 28¼?
7. How many livres in 56160 m. l. agio 20, ex. 26½?

VI. Portugal. Accompts are kept in milrees and rees.

1000 rees = 1 milree
4800 rees = 1 moidore

400 rees = 1 cruſado
6400 rees = 1 joannes.

Exchange with Britain 65 to 70d *per* milree, par 67$\frac{1}{2}$d.
———— —— Holland about 50d groſs *per* cruſado.
———— —— France about 430 rees *per* crown.

1. In 421l 17s 6d, how many milrees, ex. 67$\frac{1}{2}$d ?
2. In 1420 milrees, how many liv. exchange 432 ?
3. In 8460 milrees, how many guilders, ex. 48, agio 3 ?
4. What is the value of the moidore and joan. ex. 67$\frac{1}{2}$?
5. In 480 milrees, how much ſterling, ex. 68 ?
6. In 8718 livres, how many milrees, ex. 430 ?

VII. SPAIN. Their money is diſtinguiſhed into vellon, and old plate; the former is to the latter as 32 to 17. Shopkeepers reckon by vellon; and bills of exchange are tranſacted in plate. Accompts are kept in rials and marvadies.

34 marvadies = 1 rial
8 rial plate = 1 piaſtre
10 rial plate = 1 dollar
4 piaſtre = 1 piſtole of ex.
5 piaſtre = 1 piſtole
375 mar. = 1 ducat.

Exchange with Britain 40 to 45d *per* piaſtre, par 43d.
———— —— Holland about 110d groſs *per* ducat.
———— —— France about 18 livres *per* piſtole.
———— —— Portugal about 630 rees *per* piaſtre.

1. How much ſterling in 1500 rial plate, ex. 42d ?
2. How many current guild. in 9000 rials plate, exchange 112, agio 3 ?
3. In 12375 rial pl. how many milrees, ex. 640 ?
4. In 85l 16s 2d, how many rials vellon, ex. 41 ?
5. In 956 guild. 17 ſtivers, how many rials plate, exchange 108, agio 3 ?
6. In 4317 livres 13 ſols 8 den. how many rials plate, exchange 17$\frac{3}{4}$?

VIII. ITALY. Money is diſtinguiſhed into banco and current; the former having a conſtant ſuperiority of 20 *per cent.*; and alſo a variable agio.

Their money is likewiſe diſtinguiſhed into lire and exchange money. Accompts are kept in the former, and exchange tranſacted by the latter.

12 picoli = 1 ſoldo. 20 ſoldi = 1 lire.

Venice exchanges by the ducat banco.
Genoa ——— by the pezzo of 5¾ lires.
Leghorn ——— by the piaſtre of 6 lires.
Florence ——— by the ducat of 7½ lires.

The ducat, pezzo, piaſtre, *&c.* are each divided into 20 ſoldi; and theſe into 12 denari; in the ſame manner as the lire money, or our pound ſterling.

Pope's Territories. Accompts are kept in crowns and julios—Exchange by the ſtamped crown. 10 julios = 1 current crown; 12 julios = 1 ſtamped crown.

Naples. Accompts are kept in ducats, tarins, and grains.
20 grains = 1 tarin, 5 tarins = 1 ducat.

Exchange by the ducat = 3s 4d.

1. How much ſterling in 7860 ducats banco of Venice, exchange 52d?
2. How many ducats in 2014l 10s, ex. 51d *per* ducat?
3. How much ſterling in 448 ducats 16 ſol, ex. 51½d?
4. In 96l 6s 1½d, how many ducats, ex. 51½d?
5. In 47868 pezzo of Genoa, how much ſterling, ex. 51¾d?
6. In 10321l 10s 9d ſterling, how many pezzos, ex. 51¾d?
7. How many lires of Leghorn in 665l 2s 6d, ex. 51d?
8. How many lires of Florence in 132l 10s 6d, ex. 62d?
9. How much ſterling in 1404 current crowns of Rome, exchange 71d?
10. How much ſterling in 1102 ducats of Naples, ex. 3s 4d?
11. What French money is equal to 4878 lires of Genoa, exchange 108 ſols *per* pezzo?
12. How much money of Spain in 5512 lires 10 ſol of Florence, exchange 380 marvadies *per* ducat?
13. How much money of Holland in 1890 ducats of Venice, exchange 92d *per* ducat?
14. How much Hamburgh money current in 3720 lires current of Venice, agio 25, ex. 91d, agio 15?
15. How many ducats banco of Venice in 8664 current crowns of Rome, ex. 66 ſtamped crowns *per* 100 ducats?
16. How much money of Florence in 1890 rials plate of Spain, ex. 428 marv. *per* ducat?

IX. Denmark and Norway. Accompts are kept in rix dollars Daniſh, marcs, and ſkillings.

16 ſkillings = 1 marc.
6 marcs = 1 rix dollar.
4 marcs = 1 ort.
11 marcs = 1 ducat.

Exchange with Britain from 4 to 5 rix dollars *per* pound, par 4s 6d.

Exchange with Holland about 110 rix dollars daniſh *per* 100 rix dol. banco.

———— —— Hamburgh about 250 marc-lub banco *per* 100 rix dollars Daniſh.

1. In 6780l ſterling, how many rix dol. exchange 4$\frac{1}{2}$?
2. In 8964 rix dol. 2 mar. 8 ſk. how much ſter. ex. 4$\frac{5}{6}$?
3. In 254176 guild. current, how many rix dol. agio 4, exchange 108$\frac{1}{2}$?
4. In 8284 rix dol. how many current guild. exchange 109, agio 3?
5. How many R. in 6254 m. l. cur. agio 18, ex. 254?
6. In 6780 R. how many m. l. ex. 255, agio 18?

X. Sweden. Accompts are kept in copper dollars, marcs, and ures.

8 ures = 1 copper marc
4 cop. m. = 1 cop. dollar
3 cop. dol. = 1 ſilver dollar
2 ſil. dollar = 1 rix dollar.

To reduce copper dollars to ſilver marcs; multiply by 4, and divide by 3.

Exchange with Britain at ſo many copper dollars *per* pound ſterling.

———— —— Holland and Hamburgh at ſo many ſilver marcs *per* rix dol.

1. In 47790 cop. dol. how much ſterling, ex. 40$\frac{1}{2}$?
2. In 1407l, how many copper dol. ex. 39$\frac{1}{2}$?
3. How many guild. in 52269 copper dol. ex. 12$\frac{1}{2}$?
4. How much Swediſh money in 1000 guild. ex. 14?
5. How much Hamburgh money in 7857 cop. dol. ex. 12?
6. How many cop. dol. in 10476 marc lubs, ex. 14?

XI. Polland and Pruſsia accompts are kept in Poliſh florins, and groſs.

30 groſs = 1 florin. 3 florins = 1 rix dollar.

Exchange with Britain at ſo many pence *per* florin, par 1s 2d.
———— —— Holland at ſo many groſs *per* pound Flemiſh banco.
———— —— Hamburgh at ſo many groſs *per* rix dol. ban.

1. How much Poliſh in 5761, ex. 13½d ?
2. In 7854 florins 15 groſs, how much ſterling ex. 13¾ ?
3. How much poliſh in 2780 guild. ex. 305 ?
4. How much poliſh in 2180 marc lubs, ex. 120 ?
5. How much in 89615 guild. 15 ſtivers current, agio 2½, exchange 315 ?
6. How much in 1637 m.l. 4 ſ.l. current agio 18, ex. 312 ?
7. In 7650 florins, how many current guilders, exchange 306, agio 5 ?

XII. Russia. Accompts are kept in roubles and copecs.

100 copecs = 1 rouble.

Exchange with Britain at ſo many pence *per* rouble.
———— —— Holland about 50 ſtiv. *per* rouble.
———— —— Hamburgh about 110 copecs *per* R. lubs.

1. What ſterling is equal to 1785 roubles, ex. 4s 5d ?
2. What Hamburgh money is equal to the ſame, ex. 105 ?
3. What is the value of 1636 roubles drawn on London, exchange 4s 5½d ?
4. What is the value of 6436 roubles drawn on Holland, exchange 48 ; and from Holland on London, ex. 34s 6d ?
5. What is the value of 2160 roubles drawn on Hamburgh, ex. 108 ; and from Hamburgh on London, ex. 33s 3d ?
6. What is the value of 1728 roubles drawn on Holland, exchange 50, commiſſion there ½ *per cent.;* and from Holland on London, ex. 35s 4d ?
7. What is the value of the ſame drawn on Hamburgh, ex. 110, commiſſion ½ *per cent.;* and from Hamburgh on London, exchange 33s 6d ?

Drawing and remitting of money.

As the courſe of exchange is variable, drawing and remitting may be attended with either loſs or advantage. It being manifeſt, from a little conſideration, that the leſs value the money of a merchant's own country bears abroad, the more he will gain by drawing, and loſe by remitting; and the greater its value, the contrary. Whence, *when the exchange is made upon Britiſh money, as the pound ſterling.* &c. Britain will gain by remitting when the courſe is high, and loſe by drawing; but when the courſe is low Britain will gain by drawing, and loſe by remitting. But if *the exchange is tranſacted by the Foreign piece, as the French crown,* &c. the contrary. Therefore, *To gain*, when the exchange is by *Britiſh money*, remit when the courſe is high, and draw when it is low—When upon the *Foreign piece*, draw when the courſe is high, and remit when it is low.

To compute the gain or loſs.

Rule, When upon the Foreign piece, the ſum drawn is to the ſum remitted, as the courſe of exchange *directly*.—When upon Britiſh money, the ſum drawn is to the ſum remitted as the courſe of exchange *inverſely*.

1. What is gained or loſt by remitting 1200l ſterling to Paris when the exchange is 30d, and drawing when the exchange is 32d?
2. Edinburgh owes Ireland 480l ſterling when the exchange is 6 *per cent.*; what ſum ſhould be remitted ſhould the exchange riſe to 10 *per cent.?*
3. When the exchange with Ireland was at 9 *percent.* a merchant in Edinburgh drew for 960l ſter.; what did he gain or loſs by remitting when the ex. was at $6\frac{1}{2}$ *per cent.?*
4. London drew on Hamburgh for 1000l, ex. 36s 4d; what was gained, or loſt, by replacing the draught when the exchange fell to 33s 6d?
5. Britain drew on Amſterdam for 6000l, ex. 36s 8d, but was obliged to replace the draught when the ex. was at 33s 10d; what was loſt, or gained, on the whole, and how much *per cent.?*

6. Britain owes Jamaica 780l 15s ſter. exchange 108 *per cent.;* how much ſter. will pay the draught when the exchange is 105 *per cent.?*
7. London remitted Hamburgh 4000l, ex. 36s 6d, and drew for the value ex. 34s 2d; what was gained, or loſt, and how much *per cent.?*
8. What is gained, or loſt, by remitting 750l ſterling to Spain, ex. 40d, and drawing for the value ex. 45d, and how much *per cent.?*

Arbitration of Exchange.

Having the rates of exchange between two or more places given, to find the rate of exchange between the firſt and laſt, in correſpondence to the reſt.

Rule, Place the given equations under each other, ſo that terms of the ſame kind ſtand always on different ſides. Then take the product of the terms on that ſide of the equation, having the odd term for a dividend, and the product of thoſe on the other ſide for a diviſor: The quotient is the required quantity.

Or we may work after the manner of Proportion, by placing the odd term in the middle; and conſidering each equation as a pair of like terms.

1. If 6 yards of Hamburgh are equal to 5 in Holland, and 7 in Holland = 4 in France, and 5 in France = 5 in England; how many yds Engliſh will = 1176 yds of Hamburgh; and how many yds of Hamb. will = 100 yds Eng.?
2. If the rate of exchange between London and Holland be 34s 8d, and between Holland and Hamburgh 34 ſtivers; what is the arbitrated rate of exchange between London and Hamburgh?
3. If London exchan. with Hamburgh at 34s 6d, and Hamburgh with Holland 33 ſtivers; what is the rate of exchange between London and Holland by arbitration.
4. If London ex. with Holland at 35s 6d, and Holland with Hamburgh at 32½ ſtiv. and Hamburgh with France at 26 ſ. l.; what is the arbitrated rate of exchange between London and France?
5. Amſterdam changes on London at 34s 2d, and on Liſbon at 50d for 400 rees; how ought the exchange to go between London and Liſbon?

6. Paris remits to Amſterdam 9100 crowns by way of London at 30d, thence to Rome at 65d *per* ſtamped crown, thence to Venice at 100 ſtamped crowns *per* 140 ducats, thence to Leghorn at 100 ducats *per* 100 pias. and thence to Amſterdam at 88d *per* pias; how many guilders will be received at Amſterdam; and how many crowns will be remitted to Paris, exchange 54d?

Promiſcuous Exerciſes.

1. Leith draws on Jamaica for 1127l 10s ſterling; how much currency will pay the draught, ex. 60 *per cent.*?
2. Edinburgh owes Leghorn for a cargo, *per* the Caledonia, lires 3708; what ſterling does it amount to, exchange 4s 3d *per* piaſtre?
3. London owes Liſbon for a cargo of wine, *per* the Hopeful, 9210 milrees; how much ſterling muſt London remit Liſbon, exchange 5s 6d?
4. Amſterdam remits to London 19315 guild. current 9$\frac{7}{10}$ ſtiv. agio 2, ex. 35s 6d; for what will Amſterdam be credited in London?
5. London received 1500l for 14832 guild. due in Holland, agio 3; what was the rate of exchange?
6. Paris draws on London for 1860 livres ex. 32; what ſter. will clear the draught?
7. Hamburgh owes London for a cargo, *per* the Hazard, 18975 m. l. current, agio 15 *per cent.*; how much ſterling muſt London draw for, exchange 33s 4d?
8. In 4816 m. l. current, agio 24; how many guild. current, exchange 33, agio 5?
9. What ſterling will equal R. 7909$\frac{1}{2}$ daniſh, drawn on Amſterdam, ex. 112, commiſſion there $\frac{1}{4}$ *per cent.*; and drawn from Amſterdam on London, ex. 35s 2d?
10. How many R. will equal 10821 5s 4d ſterling drawn on Hamburgh, ex. 33s 1d, com. there $\frac{1}{4}$ *per cent.*; and drawn from Hamburgh on Denmark, ex. 254?
11. Hamburgh owes E. of Edinburgh, for nett proceeds of a cargo, 1000 m. l.; he may order it to be remitted directly, ex. 1s 6d *per* m. l. or by Holland, ex. 32$\frac{1}{2}$, and from Holland on London, exchange 35s 10d; required the cheapeſt way?
12. New England conſigns to Leghorn 1500 quintals of fiſh with orders to remit to London, the cargo is ſold at 14

piaſ. 18 ſol. *per* quintal; what ſterling will the factor remit, retaining 3 *per cent.* com. ex. 53¼d *per* piaſ.

13. London draws for 45000l on Dublin at par, and remits the ſame, ex. 110½ *per cent.* required the gain, or loſs?

14. A wood merchant in Leith imported, from Ruſſia, wood to the amount of 8760 roubles, he may order it to be drawn directly, ex. 4s 8d; or on Holland, ex. 48½, and from Holland on London, ex. 35s 10d; or on Hamburgh, ex. 106, and from Hamburgh on London, ex. 33s 6d. Required the cheapeſt medium?

15. Edinburgh owes Paris 1500 livres, how much ſterling muſt be remitted to Amſterdam to clear the draught, exchange between Paris and Amſterdam 27½, and between Amſterdam and London 36s 8d?

16. Leith owes in Denmark 8400 R. ex. 4¾; whether is it cheapeſt to remit it directly; or by Holland, exchange between Denmark and Holland 108½, and between Holland and London 35s 11d, com. in Holland ½ *per cent.*

17. Britain laid out, in purchaſing bills on Ireland, 4000l, ex. 12 *per cent.* the exchange fell to 8 *per cent.* what ſum will Britain then draw for?

18. A. of Paris draws on B. of London for 4104 crowns, exchange 52d, B. draws on A. for the value, ex. 54d, retaining ½ *per cent.* commiſſion; what did A gain, or loſe, by this tranſaction?

19. A. of Edinburgh draws on B. of Amſterdam for 7896 guild. at 22⅝d *per* guild. cur. B. draws on C. of London for the value, commiſſion ½ *per cent.* ex. 35s 10d, agio 2 *per cent.*; A. remits a bill for the value, allowing ½ *per cent.* com. for which he pays ½ *per cent.* exchange. Required the gain, or loſs?

20. A merchant in Edinburgh owes 1728 m. l. in Hamburgh, he may order it to be drawn on London, exchange 33s 4d, agio 18; or on Holland, ex. 33½, commiſſion there ½ *per cent.* ex. from Holland on London 35½; required the cheapeſt way?

21. V. of Vienna owes to London 4800 rix dollars, he may remit it directly at 3s 6d *per* rix dollar; or thro' Holland ex. 136¼ *per cent.* com. there ½ *per cent.* and ex. to London 35s; or through Hamburgh, ex. 136 *per cent.* com. ½ *per cent.* and ex. to London 34s; required the cheapeſt medium?

22. Required the value of 8960 Poliſh florins drawn on Holland, exchange 316, and from Holland on London, ex. 35s 6d; of the ſame drawn on Hamburgh, ex. 124, and from Hamburgh on London, ex. 35.

23. E. of Edinburgh drew on H. of Holland 4800 g. exch. 35s 6d at three months date, at the end of which, H. redrew on E. for the value, retaining ½ *per cent.* com. at 1 month's date, ex. 35s 4d; required E's loſs, or gain, allowing intereſt at 5 *per cent.*

24. Conſigned to my Factor at Oporto 86 pieces of linen, each 22¼ yards at 16½d; and 54 pieces ſtuffs, each 30 yds at 14d; he adviſes the ſales at 713 and 624 rees *per* yd, and that he has ſhipped, in return, 15 pipes of wine; amount, *per* invoice, 1470 milrees; required how much my Factor ſtill owes me, allowing him 3½ *per cent.* commiſſion; and alſo how much I gain upon the whole, ſuppoſing, that beſides clearing freight and charges, I diſpoſe of the wine at 10 *per cent.* advance on the invoice, ex. 5s 8½d?

INVOLUTION, OR RAISING OF POWERS.

Involution is the multiplying of a number into itſelf, any required number of times.

The number to be involved is itſelf the firſt power; or it is called the root of that power, it is required to be raiſed to. If it be multiplied once into itſelf, the product is its ſquare or ſecond power. If twice into itſelf, the product is its cube or third power; and, univerſally, any power of any number is obtained by multiplying the number into itſelf a number of times, leſs by unity than the index, or number of the power, to which it is required to be raiſed.

Table of the ſecond and third powers of the nine digits.

Firſt power or root	1	2	3	4	5	6	7	8	9.
Second power or ſquare	1	4	9	16	25	36	49	64	81.
Third power or cube	1	8	27	64	125	216	343	512	729.

Ex. 1. Raiſe 23 to the biquadratic, or fourth power.

2. Raiſe 31 to the ſurſolid, or fifth power.

3. The lineal ſide of a ſquare table was 38 inches; how many ſquare inches did it contain?

4. The lineal ſide of a ſtone of a cubic form meaſures 5 feet; how many ſolid feet does it contain?
5. How many $\frac{3}{5}$ inch cubes will I get out of a 9 inch cube?

EVOLUTION, OR EXTRACTION OF ROOTS.

Evolution, the reverſe of Involution, is the finding the root of any given number.

General Rules.

1. When the root of any number is to be extracted, it muſt be divided into periods of as many figures each, as the index of the root to be extracted, beginning at the place of units, and pointing towards the left hand in integers, and towards the right hand in decimals.
2. If there is a remainder after all the periods are uſed, the root may be continued to a decimal of any deſired number of places, by annexing periods of cyphers.
3. Any figure of the root is integral or decimal, according as the period it ariſes from conſiſts of integers or decimals.
4. To extract the roots of vulgar fractions; extract the root of each term, if it can be exactly done; if not, as is moſt frequently the caſe, reduce them to decimals; the roots of which are extracted in the ſame manner as integers.

Extraction of the Square Root.

Rule, Point the number into periods of two figures each. Find by trial, or the above table, the greateſt ſquare number contained in the left-hand period; place its root in the quotient, and ſubtract the number itſelf from ſaid left-hand period; and to the remainder annex the next period for a dividend. Write the double of the part of the root found on the left-hand of the dividend, which divide by it, omitting the right-hand figure: Place the quotient as the ſecond figure of the root, and annex it alſo to the diviſor: Multiply the diviſor, thus increaſed, by the laſt figure placed in the root: Subtract the product from the dividend, and to the remainder annex the next period for a new dividend; with which proceed in the ſame manner, and ſo on, till all the periods are uſed.

1. Required the ſquare root of 576
2. — of 20736
3. — of 622521
4. — of 788544
5. — of 1234321
6. — of 5013914481
7. — of 95023504
8. — of 15241578750190521
9. — of 65131436864025
10. — of ·5329
11. — of 5·875
12. — of 487683
13. — of 914874
14. Required the ſquare root of 6154346
15. — of 5
16. — of 17·3056
17. — of ·8281
18. — of $\frac{49}{144}$, of $\frac{81}{121}$, and of $\frac{529}{1296}$
19. — of $\frac{3}{4}$
20. — of ·000729
21. — of 784·375
22. — of $68{\cdot}\dot{3}$
23. — of $486{\cdot}\dot{1}$
24. — of ·00000784
25. — of 11
26. — of ·000000005329

Prob. 1. To find a mean proportional between two given numbers; extract the ſquare root of their product.

1. Required a mean proportional between 4 and 36?
2. ——————————— between 7 and 135?

Prob. 2. To find the ſide of a ſquare equal in area to any given ſuperficies; extract the ſquare root of the given area.

3. The area of a circle is ·7854; required the ſide of a ſquare equal in area thereto?
4. A gentleman has a fiſh-pond, in form of a triangle, containing 480 poles, he wants another of equal area, in form of a ſquare; required its ſide?
5. A plantation of an irregular form contains 6400 poles, another of a ſquare form is wanted three times as large; required the length of its ſide?
6. A clergyman's glebe conſiſts of four fields, the 1*ſt*, 2 ac. 3 roods 4 poles—2*d*, 3 acres 1 rood 20 poles—3*d*, 1 acre 15 poles—4*th*, 4 acres 3 ro. 24 poles; he wants a ſquare field in exchange equal in area to all the four; required the length of its ſide?
7. A gentleman has two fields, the firſt 7 acres 2 roods 8 poles, the ſecond 5 acres 2 roods 24 poles; he wants to

exchange them with a ſquare field of inferior quality, but one half larger; Quere the ſide of the ſquare?

8. In a ſquare plantation containing 74529 trees, the trees are planted 18 feet diſtant; required the length of the ſide?
9. There are two circular walks in a gentleman's pleaſure ground, the diameter of the one is 60 yards, and the other is five times as large; required its diameter?
10. I planted 6512490 trees in a grove whoſe length was ten times its breadth; required the number of trees in its length and breadth?
11. A gentleman has two eliptical ponds, the area of the one is 3 acres 2 roods, the other 1 acre 2 roods 20 poles; he wants a ſquare canal three times as large as both; required the length of its ſide?

Prob. 3. Given any two ſides of a right angled triangle to find the other ſide. The ſquare of the hypothenuſe or longeſt ſide, is equal to the ſum of the ſquares of the other two ſides: Therefore, the hypothenuſe is equal to the ſquare root of the ſum of the ſquares of the two ſides; and either ſide is equal to the ſquare root of the difference of the ſquares of the hypothenuſe and other ſide.

12. The three ſides of a right angled triangle are 3, 4 and 5, taking any two of them as given; required the other?
13. The length of a line ſtretched from the top of a ſteeple to a ſtation 250 feet from its bottom was found to meaſure 330 feet; Quere the height of the ſteeple?
14. Standing on the ſide of a river, I found that a line ſtretched from the top of a precipice, riſing perpendicularly 449 feet on the other ſide, meaſured 585 feet; required the breadthof the river?
15. The wall of a fortification is 248 feet high, the breadth of a ditch ſurrounding it is 224 feet; required the length of a ſcaling ladder that will reach from the farther ſide of the ditch to the top of the wall?
16. Two men travelled from the ſame place, the one north 25 miles *per* day, the other weſt 32 miles; how far were they diſtant after travelling 5 days?
17. Straight in a line betwixt two trees ſtands a ſtatute, that part of which, which is level with the bottom of the trees,

is juſt 90 feet from the top of each: The one tree plumbs 54 feet, the other 60 feet, they ſtand on the oppoſite banks of a canal; required its breadth?

EXTRACTION OF THE CUBE ROOT.

Rule, Divide the number into periods of three figures each. Find the greateſt cube number in the left-hand period, put its root for the firſt figure of the root ſought, and ſubtract the number itſelf from ſaid left-hand period; and to the remainder annex the next period for a dividend.

Find a diviſor, by multiplying the ſquare of the part of the root found by 300, divide the dividend by it; and put the quotient figure for the next figure of the root.

Multiply the part of the root formerly found by the laſt figure placed in it, and this product by 30; place this laſt product under the diviſor: And, laſtly, under this product, write the ſquare of the figure laſt placed in the root.

Multiply the ſum of theſe three by the figure laſt placed in the root, and ſubtract the product from the dividend. To the remainder annex the next period for a new dividend, with which proceed as before.

1. Required the cube root of 15625
2. — of 21024576
3. — of 52734375
4. — of 490982336369
5. — of 137173799726 0631
6. — of 67459354004042485129
7. — of 219365327791
8. — of 344237608531512161929
9. — of ·041063625
10. Required the cube root of ·484846678016
11. — of 6784
12. — of 7835·8748
13. — of 3
14. — of ·000000091125
15. — of 784·67341688
16. — of 70846
17. — of ·000918559457 28
18. — of $\frac{216}{343}$, of $\frac{125}{729}$, and of $\frac{1728}{2197}$
19. — of 7.

20. The ſolidity of a ſphere is 11390·625; required the lineal ſide of a cube of equal ſolidity?

21. The lineal ſide of a cubic piece of marble meaſured 36 feet; required the ſide of a piece $6\frac{1}{3}$ times as large?

22. A mound of earth is 660 feet long, 120 feet broad, and 208 feet deep; required the ſide of a cubic one equal to it?

23. If a globe of 8 inches diameter weighs 18 lb.; what will be the diameter of another weighing 162 lb.?

24. The length of a rectangular ciſtern is 4 feet, breadth 3 feet 4 inches, and depth 30 inches; required the dimenſions of another three times as large?

PROGRESSIONS.

An arithmetical progreſſion is a ſeries or rank of numbers uniformly increaſing or decreaſing, by the conſtant addition or ſubtraction of ſome number called the common difference: Thus 1, 2, 3, 4, 5. is an increaſing arithmetical ſeries where the common difference is 1, and 10, 8, 6, 4, 2. is a decreaſing arithmetical ſeries where the common difference is 2.

A geometrical progreſſion or ſeries is a rank of numbers uniformly increaſing or decreaſing, by a conſtant multiplier, or diviſor, called the common ratio; thus 1, 2, 4, 8, is an increaſing geometrical ſeries where the common ratio is 2, and 27, 9, 3, 1. is a decreaſing geometrical ſeries where the common ratio is 3.

The firſt and laſt terms are called extremes, and the other terms means.

Arithmetical Progreſſion.

Of theſe five, *viz.* The two extremes, common difference, number of terms, and ſum of the ſeries; having any three given the other two may be found.

Theor. The ſum of the extremes is equal to the ſum of any two means equally diſtant from them.

Prob. 1. Given the extremes and number of terms to find the other two.

Rule, The common difference is equal to the difference of the extremes divided by the number of terms minus one. And the ſum of the ſeries is equal to the ſum of the extremes multiplied by half the number of terms.

1. Given the extremes, 12 and 42, and the number of terms 11; required the common difference, and ſum of the ſeries.
2. A perſon owed a certain ſum which he paid in 13 different payments, increaſing in arithmetieal progreſſion, the firſt payment was 3s, the laſt 2l 11s; how much did each payment exceed the former, and how much did he owe in all?
3. A farmer bought 100 ſheep, and gave for the firſt 1s, for the laſt 19l 17s; what did he give for the whole, and how much did the price of any one exceed that of the preceding?

Prob. 2. Given the extremes and common difference; required the number of terms and ſum of the ſeries.

Rule 1. Divide the difference of the extremes by the common difference; the quotient plus one, will be the number of terms.——2. Divide the difference of the ſquares of the extremes by twice the common difference, and this quotient added to half the ſum of the extremes will give the ſum of the ſeries.

4. Given the extremes 7 and 103, and the common difference 4; required the number of terms and ſum of the ſeries?
5. A nurſery man planted a number of firs in form of an iſoſceles triangle, he put 1 plant in the firſt row, 3 in the ſecond, and ſo on in arithmetic progreſſion, the laſt row contained 61 plants; required the number of rows, and the whole number of plants?
6. A perſon meeting with a number of poor people gave the firſt 2d, the ſecond 5d, and ſo on until the laſt, to whom he gave 2s 8d; required the number of poor people, and how much they received in all?
7. A perſon travelling from one city to another went 6 miles the firſt day, 9 the ſecond, and ſo on in arithmetical progreſſion, his laſt day's journey was 60 miles; required the number of days he travelled, and the diſtance of the cities?

Prob. 3. Given the common difference, number of terms, and ſum of the ſeries, to find the reſt.

Rule, Divide the number of terms minus 1, by 2; multiply the common difference by the quotient: Add and ſubtract this product to and from the ſum of the ſeries, divided by the number of terms; the ſum and remainder will be the greater and leſs terms reſpectively.

8. Given the number of terms 9, the common difference 2, and the ſum of the ſeries 135; required the extremes?
9. A perſon diſcharged a debt of 210l 12s in a year, by paying every week 3 ſhillings more than he did the preceding; Quere the firſt and laſt payments.

Prob. 4. Given either of the extremes, the common difference, and number of terms, to find the reſt.

Rule, Multiply the common difference by the number of terms, minus 1; this product added to the leſs extreme gives the greater, or ſubtracted from the greater extreme leaves the leſs.

Add ſaid product to twice the leaſt extreme, or ſubtract it from twice the greater; multiply the ſum or remainder by half the number of terms, either of theſe will give the ſum of the ſeries.

10. Given the leaſt extreme 12, common difference 3, and number of terms 11; required the greater extreme, and ſum of the ſeries?
11. Given the greater extreme 123, common difference 5, and number of terms 24; required the leſs extreme, and ſum of the ſeries?
12. A ſum of money was divided among 12 perſons whoſe ſhares were in arithmetical progreſſion, the firſt received 3s, the ſecond 7s, and ſo on; required the ſum divided among them, and the ſhare of the laſt?
13. A traveller ſets out on a journey which he accompliſhes in 15 days by travelling every day 3 miles more than he did the preceding, and travelling 49 miles the laſt day; required how many miles he travelled the firſt day, and the length of the journey?

Geometrical Progreſſion.

Theor. The product of the extremes is equal to the product of any two means equally diſtant from them.

Prob. 1. Given the leaſt extreme, ratio and number of terms, to find the greater extreme, or any diſtant term.

Rule; Raiſe the common ratio to a power leſs by unity than the number of the required term; multiply that power by the leaſt term, the product is the greateſt.

14. Given the leaſt term 3, the ratio 2; required the 8th term?

15. Given the leaſt term 5, the ratio 3, number of terms 6; required the greateſt?

16. A merchant bought 12 yards of cloth at the price of the laſt yard, reckoning 1d for the firſt, 2d for the ſecond, and ſo on in geometrical progreſſion; required how much he paid?

17. A farmer bought 15 oxen for the price of the 10th, reckoning 2d for the firſt, 6d for the ſecond, *&c.* How much did he give, at an average, for each?

Prob. 2. Given the extremes and ratio to find the ſum of the ſeries.

Rule, Multiply the laſt extreme by the ratio; from this product ſubtract the firſt extreme, and divide the remainder by the ratio minus 1.

18. Given the extremes 1, and 2187, and ratio 3; required the ſum of the ſeries?

19. What debt will be diſcharged by weekly payments of which the firſt is 5s, the laſt 2048l, the ratio being 2?

ALLIGATION.

Alligation directs computations relating to the mixing of ſimples of different qualities, and is diſtinguiſhed into *medial* and *alternate*.

Alligation Medial. Given the quantities and rates of the ſeveral ſimples to find the rate of the mixture.

Rule, Multiply each quantity by its rate, and divide the ſum of the products by the ſum of the quantities.

1. Eight lbs of ſugar at 7d *per* lb. was mixed with 5 lb. at 8d, and 7 lb. at 1s; what was the price of the mixture *per* lb.?
2. 8 lb. tea at 5s 7$\frac{1}{2}$d was mixed with 12 lb. at 8s 3d and with 16 lb. at 9s; required the value of a lb. of the mixture?
3. If 7 gal. brandy at 6s 3d be mixed with 9 gal. at 7s 6d, 12 gal. at 7s 11$\frac{1}{4}$d, and 4 gal. at 10s 3d; what is the mixture worth *per* gallon?
4. If 9 gal. wine at 5s 4d be mixed with 8 gal. at 6s 8d, 8 gal. at 7s 7d, and with three of water; what is the value of the mixture *per* gallon?
5. A compounder of ſpirits mixes 18 gal. at 3s 6d with 12 gal. at 5s 7d, and 16 gal. at 4s 4d; at what muſt he ſell the compound that his gain may be 10 *per cent.*?

Alligation Alternate. Given the rates of the mixture and ſimples to find the quantity of each ſimple.

Rule, Write the rates of the ſimples under each other, with the mixture rate on their left-hand. Connect the rates of the ſimples, ſo that one leſs than the mixture rate be always linked with one that is greater. Write the difference betwixt the mixture rate and that of each of the ſimples oppoſite to that rate with which it is linked. Theſe differences, or their ſum if more than one, will be the quantities at the rates oppoſite to which they ſtand,

6. How much corn at 2s 6d *per* buſhel and 3s 4d *per* buſhel muſt be mixed together, that the compound may be worth 3s *per* buſhel?
7. How much tea at 3s and 2s muſt be mixed together to form a compoſition worth 2s 6d?
8. How much ſugar at 4d, 6d, and 9d, muſt be mixed together that the compoſition may be worth 8d?
9. How much wine at 4s, 5s, 6s, and 8s, muſt be mixed together that the compound may be worth 7s?

Note, *If the compoſition be limited to a certain quantity, ſay, As the ſum of the quantities, found as above,* : : *to the gi-*

ven quantity :: *ſo is each of the quantities found* : *to the required quantity of each.*

10. How much brandy at 4s, 5s, and 6s *per* gallon muſt be mixed to form a compoſition of 24 gal. worth 5s 6d?
11. How much ſnuff at 4s, 6s, and 9s *per* lb. muſt be mixed together to form a compoſition of 40 lb. worth 7s *per* lb.?

Note 2. *If one of the ſimples be limited, ſay, As the quantity of that ſimple found by the method of linking* : *is to the limited quantity,* :: *ſo are the other quantities found* : *to the required quantity of each.*

12. How much wine at 4s, 6s, and 7s *per* gal. muſt be mixed with 6 gal. at 5s *per* gallon, that the mixture may be worth 5s 6d *per* gallon?
13. How much corn at 7s, 9s, and 10s *per* buſhel muſt be mixed with 6 buſh. at 8s *per* buſh. that the mixture may be worth 8s 6d *per* buſhel?
14. How much brandy at 5s, at 5s 6d, and at 6s *per* gallon muſt be mixed with 3 gal. at 4s *per* gal. that the compound may be worth 5s 4d *per* gallon?

POSITION.

In this rule take any convenient number and proceed with it according to the tenor of the queſtion, if the reſult or number thus obtained be the ſame as the given number, the poſition or aſſumed number is the number ſought, if not proceed by the following rules.

Rule 1ſt, When the reſult is proportional to the poſition, the reſult : is to the given number :: as the poſition : to the required number.

1. What number is that to which if we add the half, the third and fourth of itſelf, the ſum will be 125?
2. A Jockey being aſked the value of his horſe ſaid, that if from his value you take $\frac{1}{3}$ and $\frac{1}{4}$ thereof, the remainder will be 15; required what he valued his horſe at?
3. A man being aſked his age ſaid, If to my age you add $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, thereof, the number 63 will then be had; Quere his age?

4. Required a number to which $\frac{1}{3}+\frac{1}{4}$ of itſelf being added, and $\frac{1}{3}$ of the ſum ſubtracted, the remainder ſhall be 76?
5. The number of fruit-trees in a garden were 252, there were $\frac{1}{3}$ more bearing apples than pears; the number of thoſe bearing plumbs were $\frac{4}{3}$ of thoſe bearing pears; and the number of thoſe bearing cheries $\frac{4}{3}$ of thoſe bearing plumbs; how many were there of each?

Rule 2. When the reſults are not proportional to the poſition; that is, when ſome given number is added to, or ſubtracted from the poſition in the courſe of the proceſs; try two numbers, as above, and find the errors or differences between the reſults and the given number: Multiply each of theſe errors by the other's poſition; then if the errors be of the ſame kind; that is, both leſs, or both greater than the given number; divide the difference of the products by the difference of the errors; but if the one error is greater, and the other leſs than the given number; divide the ſum of the products by the ſum of the errors; the quotient in each caſe will be the anſwer.

6. What number is that which being doubled, and 16 added to the product, the ſum ſhall be 56?
7. Three men, A. B. and C. have 36l to be divided among them, ſo that B's ſhare is 4l more than $\frac{2}{3}$ of A's, and C's 5l more than $\frac{3}{4}$ of B's; required their ſhares?
8. What number is that which, being multiplied by 7, and leſſened by 30, if the remainder be divided by 5, the quotient will be the ſame as the required number?
9. A perſon mixes 60 gallons of wine, part worth 8s *per* gallon, and the remainder worth 10s; ſo that the value of the mixture is 8s 10d; required the quantity of each?
10. A politician, having about him a certain number of crowns, ſaid, if $\frac{1}{6}+\frac{1}{8}+\frac{1}{9}+\frac{1}{12}$ of what he had were added to 10, the ſum would juſt make Wilkes's number (45); required the number of crowns?
11. A gentleman ſerving ſome beggars, found that if he gave each 4d he would have 8d left; but if he gave each 5d, he would want 4d; how many beggars were there?

DUODECIMALS, *or* MULTIPLICATION OF FEET AND INCHES.

Note, A foot is divided into 12 inches, an inch into 12 parts or primes, a prime into 12 ſeconds, &c.

Rule, Write the multiplier under the multiplicand; feet under feet, inches under inches, *&c.*

Firſt, Multiply the multiplicand, beginning at the loweſt denomination, by the feet in the multiplier; and place each product under that denomination of the multiplicand from which it ariſes; always carrying at 12. Next, multiply by the inches, and ſet each product a place farther towards the right hand. *Laſtly*, Multiply by the parts, and ſet each product another place towards the right hand.

1. 48 ft 6 in. × 3 ft 4 in.
2. 98 3 × 5 6
3. 548 5 × 7 11
4. 141 6 × 6 10
5. 891 5 × 9 8
6. 146 3 × 8 9
7. 678ft 4in. 8p. × 7ft 11in.
8. 37 6 9 × 11 10
9. 35 11 10 × 10 11
10. 67 8 11 × 9 11
11. 87 6 8 × 11 10
12. 83 ft 4 in. 5 p. × 9ft 10in.
13. 87 11 11 × 11 11
14. 78 11 4 × 7 8 3 p.
15. 63 4 8 × 8 9 6
16. 91 4 9 × 9 7 9
17. 33 0 8 × 7 6 8
18. 55 8 7 × 72 0 8
19. 77 11 8 × 37 11 8
20. 88 10 4 × 48 10 0
21. 73 5 8 × 33 6 4
22. 96 8 9 × 55 11 9

N. B. Menſuration is either lineal, ſuperficial, or ſolid. Lineal menſuration reſpects mere length, and is found by applying a ruler of a known length. Superficial meaſure reſpects the face or ſurface of any thing, and is found by multiplying the length into the breadth; and therefore if the two factors, in the above examples, be conſidered as the lengths and breadths of windows, deals, *&c.*; then will the ſeveral products expreſs the meaſures of the ſurfaces, or ſuperficial areas, of theſe things. Solid meaſure is computed by multiplying the length into the breadth, and that product into the thickneſs or height

23. In a deal 57 feet 8 inches long, 2 feet 7 inches 3 pr. broad; how many ſuperficial feet?
24. How many feet in the floor of a room 46 feet 8 inches long, and 25 feet 4 inches broad?

25. The floor of a room meaſured 74 feet 10 inches by 53 feet 3 inches; required its ſuperficial content?

26. A window meaſured 7 feet 8 inches 6 pr. by 4 feet 9 inches 8 pr.; how many ſuperficial feet does it contain?

27. What is the ſolid content of a ſtone 3 feet 11 inches thick, 7 feet 9 inches broad, and 13 feet 8 in. long?

28. The dimenſions of a piece of mahogany are 7 feet 8 in. 3 primes, 9 feet 5 inches 4 p. and 58 feet 6 inches; required its ſolid content?

29. Required the ſuperficial and ſolid content of a wall 37 feet 8 inches long, 7 feet 9 inches high, and 2 feet 10 inches thick?

30. What is the ſolid content of a block of marble, whoſe three dimenſions are 4 feet 8 inches, 3 feet 11 inches, and 2 feet 3 inches?

31. How many gallons of water (wine meaſure) will a ciſtern contain, whoſe inſide dimenſions are 38 feet 6 inches, 23 feet 4 inches, and 11 feet 9 inches?

32. How many gallons of ale will another, whoſe dimenſions are double of the former, hold?

33. Required the number of feet in a plank of wood 16 ft 11 inches long, 3¼ feet broad, and 2 feet 10 inches 4 parts thick?

34. A log of wood, 14 feet 10 inches long, was ſawed into 7 deals, each 2 feet 11 inches broad; how many ſuperficial feet did they contain?

35. How many feet are there in 5 deals 12 feet 8 in. long, and their breadths 2 feet 2 inches, 2 feet 8 inches, 3 feet 5 inches, 3 feet 9 inches, and 3 feet 11 inches?

36. What is the difference of the areas of the floors of two rooms, the one 36 feet 7 inches by 22 feet 10 inches, the other 27 feet 11 inches by 19 feet 7 inches?

37. What is the ſolid content of a box 7 ft 9 in. 3 p. long, 2 ft 3 in. 6 p. broad, and 1 ft 11 in. 11 p. thick?

MISCELLANEOUS QUESTIONS.

1. London conſumes annually 98245 black cattle, ſuppoſe at 18 guineas each; 711124 ſheep and lambs, ſuppoſe at 35s, 194770 calv. 23s, 186934 ſwine at 46s, 115536 pigs at 15s 6d, 14740100 buſhels of oiſters at 17s, 1398 boats of various kinds of other fiſh at 3 guineas a boat, 16000000 lb.

butter at 8¾d, 20000000 lb. cheeſe at 6¾d, 7000000 gal. milk at 8d, 1172494 bar. ſtrong beer at 36s, 798495 ſmall beer at 14s, 3044 ton wine at 9s *per* gal. 11000000 gal. ſpirits at 7s 6d, 11000000 lb. candle at 7½d. How much does London lay out annually on theſe articles?

2. In a ſhoal of herrings 7 miles in length, 2½ in breadth, and 350 yards deep; how many herrings, allowing 172 to a ſolid foot; and how many caſks would they fill, each containing 815?

3. 20l 6d is to be divided among four claſſes of poor people; there are 7 in the firſt claſs, 9 in the ſecond, 15 in the third, and 20 in the fourth; the ſhare of the firſt is double that of the ſecond, the ſecond triple that of the third, and the third quadruple that of the fourth; required the ſhare of each claſs?

4. A dealer in cloth carried to market 27¾ yards, which he ſold at 2s 11½d; 35½ yards, of which he ſold 26 yards at 15s 10¾d, and the remainder at 15s 7½d; 25 yds, which he ſold at 5s 3¾d; 3 pieces, each 26½ yards, of which he ſold 52¼ yards at 6s 8¼d, and the remainder at 6s 9¾d; His expences amounted to 13s 6d; and alſo paid a bill of 3l 17s 6d. How much caſh did he bring home, ſuppoſing he had two marks and a noble when he went away?

5. A miller bought 1100 qrs of wheat at 35s 6d, and 175 qrs barley at 22s; the wheat produced 2¼ ſtone flour *per* buſhel, which he ſold at 23½d *per* ſtone; the barley produced 2⅞ ſtone *per* buſhel, which he ſold at 13¼d *per* ſtone. Required his gain upon the whole, allowing 4l 13s for grinding and other expences?

6. A farmer poſſeſſes 24 acres at 25s *per* acre, which is laid out in four equal diviſions: The 1*ſt* is ſown in wheat, and produces 5 qrs *per* acre at 37s; ſeed 6 buſhels *per* acre—2*d*, Barley produces 5 qrs at 25s; ſeed 3½ buſhels —3*d*, Oats produce 4¾ qrs at 16s; ſeed 5 buſhels—4*th*, Graſs produce in whole 160 ſtone hay at 4¾d *per* ſtone. What has the farmer for his expence of time and labour?

7. If an acre of ground produces 4½ qrs wheat, and each peck gives 20 lb. of bread; how much ground will be neceſſary to ſupply a city of 5000 families with bread for a year, ſuppoſing each family uſes 12 lb. *per* day: And how much would ſupply all the inhabitants of Britain with

bread for the ſame time, taking their number at 8000000, and allowing each perſon 1½ lb. *per* day?

8. A merchant ſold 8 pieces of linen, each 27 yds at 3s 7d *per* yard; 78 yards cotton at 1s 3d; 4 pieces corduroys, each 30 yds at 2s 7d; 5 pieces velverats, each 37 yards at 3s 2d; but the buyer being deſirous of a year's credit, is willing to allow 5 *per cent.* for it; how much will he have to pay at the end of the year?

9. Bought a quantity of cloth at 412l 10s; 85 yds getting damaged was ſold at 15s, whereby I loſt 6l 7s 6d; but ſold the remainder ſo as to gain 17l 16s 8d upon the whole; required the quantity bought, and at what the undamaged part was ſold?

10. A bankrupt owed to his three creditors 48l 15s, 72l 10s, and 84l 13s 4d; his effects amounted to 100l. It is required to divide it among his creditors according to their claims?

11. Received 125 yards of cloth at 5s 6d, for 215 lb. tea; required the price of the tea?

12. A. has 13 cwt 21 lb. of hops at 35s *per* cwt, which he would barter with B for 3 joannes, 7 half-guineas, 4 moidores, and brandy at 11s 6d *per* gallon; how much brandy muſt be given?

13. Bought goods to the value of 360l, and ſold them at 400l, payable in 6 months; what was my gain, or loſs?

14. A. barters with B. 16 pieces of cloth, each 25 yards at 10s *per* yard, for 64 ſtone wool at 14s *per* ſtone, and 80l in caſh; the balance is to be paid in cotton at 9d *per* lb.; how many lb. muſt be given?

15. A. gives B. 3 cwt 3 qrs 15 lb. of tea at 6d *per* oz. for 6 hhds 22 gallons of wine; how was the wine rated *per* gallon?

16. A. barters with B. tea worth 5s 6d at 6s 3d, for rum worth 7s at 7s 11d; who has the advantage, and how much?

17. C. barters with D. 3 cwt of tea worth 7s *per* lb. at 7s 4d, with cloth worth 2s 4d at 2s 6d; who had the advantage in barter, and how much cloth did C. get?

18. A pipe of wine containing 55 dozen may be ſold preſently at 39s *per* dozen; or 2½ years hence at 46 6d *per* dozen; but beſides loſing the intereſt at 5 *per cent.* the

eakage will be $2\frac{1}{8}$ doz. and other charges 17s; required the gain, or loſs, by keeping it?

19. A. values cloth in barter at 6s 3d, worth only 5s 9d; how muſt B. value cloth worth 7s 2d to be even with him?

20. A. barters with B. 102 lb. tea at 4s 9d, 36 lb. ditto at 3s 6d, and 54 lb. ditto at 7s 4d, for 546 lb. ſugar at 3l 8s *per* cwt, 735 lb. ditto at 4l 16s, and the balance in caſh; required how much caſh was given?

21. A woollen manufacturer ſold 3 pieces broad cloth, each 27 yds at 17s 3d; and 5 pieces narrow ditto, each 31 yds at 11s 7d; he allows 5 *per cent.* diſcount for prompt payment; what did he receive?

22. Bartered $56\frac{1}{2}$ lb. tea at 11s 5d, with tobacco at 7l *per* cwt; how much tobacco did I receive, and at what rate *per* lb.?

23. Bartered 3 puncheons of rum and 12 ankers of brandy, with 17 cwt 3 qrs 23 lb. tobacco at 6l 18s *per* cwt, and 5 cwt 19 lb. of ſugar at 15s 6d *per* qr; required the price of the brandy and rum *per* gallon, the brandy being deareſt by $1\frac{1}{8}$s *per* gallon?

24. A. barters with B. 750 qrs of wheat at 39s 6d *per* qr, with 540 qrs barley, and 760l 10s of money; what was the price of the barley?

25. A butcher agrees with a grazier to feed 30 ozen for a year at 3l 5s each, but at the end of 3 months the butch. adds 6 more, and at the end of 6 months 9 more; how long may the whole be continued for the ſum already ſtipulated, or what will be due the grazier if the whole are continued to the end of the twelve months?

26. The average price of the 30 oxen was 4l 5s, of the ſix 5l 18s, of the nine 6l 14s, and after fulfilling the original agreement, he feeds each with 18 pecks of corn at 16s 4d *per* qr, and 24 truſs of hay at 1s 2d *per* truſs; he ſlaughters them, and their average, weight and price, was as follow, *viz.* Beef 32 ſtone at $3\frac{3}{4}$d *per* lb. tallow 5 ſtone at $6\frac{1}{2}$d *per* lb.; hide one guinea; required the gain, or loſs?

27. A contractor engages to ſupply a ſhip with proviſions, and receives 15s *per* month of 28 days for each private man, thrice as much for each officer, and 6 times as much for the captain. The crew conſiſts of the captain, 8 officers, and 160 private men. He provides 35 bar. beef at 35s 6d, 16 ditto pork at 52s, 8 ton $15\frac{1}{2}$ cwt of bread at

25s *per* cwt, 82 buſhels of peaſe at 5s, 26 cwt 2 qrs 21 lb. cheeſe at 30s *per* cwt, 18 cwt 3 qrs 16 lb. butter at 3l 14s 8d *per* cwt, 26$\frac{1}{2}$ qrs oat-meal at 19s, 8 cwt fiſh at 26s, other ſmall charges amount to 1l 7s 3$\frac{1}{2}$d; at the return of the ſhip he finds his profit is 185l 5s 5d. How long was the voyage?

28. Imported 120 jars of oil, each containing 1180 ſolid in. (231 inches = 7$\frac{1}{2}$ lb.); what came the freight to at 5s 3d *per* cwt, deducting tare at 7 lb. *per* cwt?

29. A privateer, conſiſting of a captain, firſt and ſecond mates, a ſurgeon, a carpenter, 52 ſailors, and 42 mariners, took a prize of 31235$\frac{2}{5}$l, of which the proprietors are to have $\frac{2}{3}$; and of the remainder the captain is to have nine ſhares; the firſt mate, ſurgeon, and carpenter, each 6$\frac{1}{3}$ ſhares; the ſecond mate 5 ſhares; each ſailor 1$\frac{1}{4}$ ſhare; each marine $\frac{6}{7}$ of a ſhare. How much will each get?

30. What was that gentleman's yearly income, who lets his eſtate of 19602 Scotch acres at 1$\frac{3}{4}$ nobles *per* Eng. acre

31. A father left his eſtate to his wife and three ſons as follows: To his eldeſt ſon $\frac{1}{2}$ wanting 140l, to his ſecond ſon $\frac{1}{4}$ plus 20l, to his youngeſt ſon $\frac{1}{3}$ wanting 220l, and to his wife $\frac{1}{5}$; required his eſtate, and the ſhare of each?

32. A bankrupt's effects amounted to 1850l, it is required to divide it among his ſix creditors, whoſe ſhares were to each other as the numbers 3, 5, 7, 9, 11, 13?

33. Four men A. B. C. and D. got a preſent of a guinea, of which A. claims $\frac{1}{2}$, B. $\frac{1}{3}$, C. $\frac{1}{4}$, D. $\frac{1}{5}$, but find it too little; it is required therefore to determine their ſhares of it in the above proportion?

34. Three men E. F. and G. enter into company, E. continued his ſhare of the ſtock for 4 months, and claimed $\frac{1}{3}$ of the profits, F's continued 9 months, G. continued his ſtock of 550l for 8 months, and required $\frac{1}{2}$ of the gain; required E. and F's ſtocks?

35. Suppoſe an wolf could devour a ſheep in an hour, a tyger in $\frac{1}{3}$ hour, and a lion in $\frac{1}{2}$ hour; and that the wolf eats 10 minutes by himſelf, after which the tyger arrives and eats along with him 10 minutes longer, then the lion arrives and all three eat together; required the time in which the ſheep will be devoured?

36. Sent as an adventure to Denmark 300 pieces of linen, each 25$\frac{1}{2}$ yds, bought at 19$\frac{1}{2}$d *per* yard, the freight is 8$\frac{1}{2}$d

per piece, duty there $3\frac{3}{7}$ ſch. *per* yard; the whole is ſold at 3 mar. 12 ſch. *per* yard; how much did I gain, or loſe, allowing my factor $2\frac{1}{4}$ *per cent.* com. and ex. $5\frac{1}{2}$ rix dollars?

37. Conſigned to my factor in Amſterdam 27 hhds tobacco, 12 cwt 1 qr 8 lb. each which *per* advice is ſold at $21\frac{1}{2}$ ſt. *per* lb.; how much ſterling may I draw for allowing $8\frac{1}{2}$ *per cent.* for com. and charges, ex. 35s 9d?

38. L. of London remits to B. of Hamburgh ml. 2000, ex. 35s $4\frac{1}{2}$d, payable in 2 months, at the end of which B. remits the value to L. deducting $\frac{1}{2}$ *per cent.* com. in a bill of 4 months date, ex. 34s $2\frac{1}{4}$d; required L's gain, or loſs, intereſt at 4 *per cent.*?

39. Conſigned to my factor at Hamburgh 13 hhds ſugar, each 7 cwt 3 qrs 18 lb. which *per* account of ſales is ſold at $5\frac{3}{4}$ fl. *per* lb.; how much ſterling will my factor remit me, retaining 8 *per cent.* for com. charges and bad debts, agio 20 *per cent.* ex. 35s $6\frac{3}{4}$d?

40. London owes Madrid 5000 rial plate, it may be remitted directly, ex. $44\frac{1}{2}$. Or by way of Amſterdam, ex. between London and Amſterdam 36s 9d com. there $\frac{1}{2}$ *per cent.* ex. between Amſterdam and Madrid 112. Or by France, ex. between London and Paris $28\frac{1}{2}$, com. $\frac{1}{4}$ *per cent.* and between Paris and Madrid $18\frac{1}{2}$?

41. P. of Portugal may draw on B. of Britain for 2000 milrees at 5s 8d. Or on H. of Holland, ex. $50\frac{1}{2}$d *per* cruſado, who will draw on B. of Britain for the value including $\frac{1}{4}$ *per cent.* com. ex. 36s 10d. Or on R. of Paris, ex. 433 rees *per* crown, who will draw on B. com. $\frac{1}{2}$, ex. 29; required which way is cheapeſt?

42. The rent of a fiſhery is 360l; the tenant employs 8 men at 10d *per* day, and an overſeer at double wages; the fiſhermen have alſo $\frac{1}{7}$ of the fiſh: The fiſhing ſeaſon continues 249 work days, and they catch, at an average, 250 fiſh in eight days—weight, at an average, 8 lb. each. The expence for boats and nets is 60l; the fiſh are packed in barrels, each containing 3000 lb. price of the barrels 2s 6d, ſalt 1s 6d; required at what they muſt be ſold *per* barrel, that the tenant's gain may be $\frac{1}{7}$ of the whole?

43. A city is ſupplied with water brought in pipes from three different fountains at the diſtance of $1\frac{3}{4}$ miles, $2\frac{5}{8}$ m. and $2\frac{7}{8}$ miles reſpectively; each foot of pipe weighs

12 lb. at $2\frac{3}{4}$d *per* lb.; expence of laying them is 13d *per* yard; ciſterns and other expences $45\frac{1}{3}$l: 600 of the ininhabitants agree to pay as much annually as will amount to the intereſt of the money, expended at 5 *per cent.* how much muſt each pay?

44. The diameters of the bores of the pipes are $4\frac{1}{2}$ inches, $5\frac{1}{4}$ inches, $6\frac{1}{4}$ inches; the firſt runs 4 gallons of water *per* minute, and the quantities ſupplied by the others are as the ſquares of their diameters directly. Now it was found that the number of families in the whole city was ſuch, that each (ſuppoſing them all to have the ſame quantity) would have exactly as many gallons *per* day, as the firſt pipe furniſhed *per* minute; required the number of families?

45. How much timber are there in a log 3 feet 8 inches by 2 feet 11 inches, and $37\frac{3}{4}$ feet long?

46. In another 2 feet 10 inches by 1 foot 9 inches, and 33 feet long?

N. B. Unequal ſquared timber, which is larger at the one end than the other, is commonly meaſured by taking the dimenſions in the middle. Round timber is meaſured by girding it about the middle with a ſmall cord, one fourth of the girt is conſidered as the ſide of a ſquare log of equal dimenſions. Tapering timber is meaſured by girding it in two or more places, and dividing the ſum of the girts by their number for the mean girt.

47. How much timber in a round tree 27 feet long, and girt in the middle 75 inches?

48. In another 31 feet long, and girt 55 inches?

49. In another 25 feet 6 inches long, and girt 37 inches?

50. In another 37 feet long, and girts in 3 places, 72 inch. 60 inches, and 54 inches?

51. In another 65 feet long, and girts 84 inches, 76 inches, 63 inches, 56 inches, and 46 inches?

52. How many ſquare yards of wainſcoating are there in a room 68 feet in circuit, and 11 feet 2 in. high?

53. In another 37 feet long, 25 broad, and 9 feet 8 inches high?

54. In another 74 feet in circuit, $12\frac{1}{2}$ feet high, allowing work and half for a door 6 feet 9 in. by 2 feet 10 in. and for 2 windows with ſhutters, each 5 feet 8 inches by $3\frac{1}{2}$ feet, deducting a vacancy for a chimney 6 feet 3 inches by 5 feet 6 inches?

55. How many ſquares (ſquare$=$100 ſuperficial feet) of flooring in a houſe of 5 floors, 64 feet by 34 within the walls, deducting from each floor the vacancy for the ſtair 12 feet 3 inches by 8 feet; required alſo the value at 46s *per* ſquare?

56. How many yards of painting in a room 38 feet long, $23\frac{1}{2}$ broad, and $11\frac{1}{2}$ feet high, deducting the chimney 4 feet 8 inches by $3\frac{1}{2}$ feet; and how much does it come to at 20d *per* yard?

57. How many yards of plaſtering on a wall 24 feet long, and 12 feet 9 inches high?

58. How many in 3 rooms, the firſt 24 ft by $16\frac{1}{2}$ ft, the ſecond $34\frac{1}{2}$ feet by 21 feet 9 in. the third 40 feet by 34 ft, their common height $10\frac{1}{2}$ feet, deducting 3 doors, each $6\frac{1}{2}$ feet by 3 feet; and what is the value, the ceilings being reckoned at 8d, and the walls at 3d *per* yard?

59. How many rood (rood = 36 ſquare yards) of maſon-work in a wall 36 feet long, and 15 feet high?

60. How many in a wall 108 feet long, and $22\frac{1}{2}$ feet high; and how much did it come to at 32s *per* rood?

> *N. B.* Two feet is commonly reckoned the ſtandard thickneſs for ſtone-walls; and walls of any other thickneſs muſt be reduced to it. And one, and one half brick thick, or three half bricks thick, is the ſtandard thickneſs for brick walls.

61. What is the expence of a wall 27 feet long, 24 ft high, and 3 feet thick, at 30s *per* rood?

62. How many yards of brick-work in a wall 56 feet long, 24 feet high, and $2\frac{1}{2}$ bricks thick?

63. How many in a wall 125 feet long, and 14 feet 8 inch. high, and $2\frac{1}{2}$ bricks thick?

64. How many feet of hewn work in a ſtone 13 feet 6 in. by 3 feet 8 inches?

65. In 8 others, each 12 feet 4 inches by 5 feet 9 inches?

66. What will the paving of a ſtreet come to at 6½ *per* yd, its length ¾ mile, and breadth 66½ feet?

67. What will the glazing of 9 windows come to, at 9¾d *per* foot, three 6½ feet high, three 5½ feet, and the remaining three 4¼ feet high, and their breadth 3 feet 8 in.?

68. How many deals 33 feet by 8 inches will floor a room 33 feet by 28 feet?

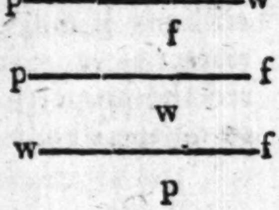
69. How many 15 feet long, and 1½ foot broad, will floor a room 60½ feet by 33½?

70. How many ſolid yards of digging in a celler 24 feet long, 13½ broad, and 3 yards deep?

71. What will the digging of the foundation of a houſe 68 feet long, 33 broad, and 5 feet deep, come to at 15d *per* ſolid yard?

72. If the weight of mercury be to that of water as 13½ to 1 and a cubic foot of water weigh 62½ lb.; and the height of the mercury in the barometer (the weight of which is equal to the weight of a column of air on the ſame baſe extending to the top of the atmoſphere) be 30 inches; what then is the weight of the air upon a man's body, which meaſures generally about 15 feet ſquare; and what is the whole weight of the atmoſphere, the earth's ſurface being 198943750 ſquare miles?

73. If the proportion of ſea to that of land upon the ſurface of the earth, be as 21 to 10, and the mean depth of the ſea 440 yards; what will be the weight of the whole body of water in the ſea, and what will be the weight of the whole body of ſalt, or other particles wherewith it is impregnated, the weight of the ſea to that of pure water being as 103 to 100?



N. B. There are three ſorts of levers according to the different ſituations of the power, the fulcrum, or prop, and the weight as in the annexed diagram. Now in all the mechanic powers, the momentum of the power is equal to the momentum of the weight; or in other words, the power multiplied into its velocity is equal to the weight multiplied into its velocity. Therefore, putting p = power, w = weight, D = the diſtance between the power and fulcrum, and d = diſtance between the weight and fulcrum, then $p\times D = w\times d$, whence $p = \frac{w\times d,}{D}$ $w = \frac{p\times D,}{d}$ $d = \frac{w\times d,}{p}$ and $d = \frac{p\times D.}{w}$

74. Let p=5 D=100 d=10 w=50, conſidering any three of theſe as given; required the others?

75. Let p=5, D=110, d=10, w=55, conſidering any three of theſe as given; required the others?

76. Let p=55, D=10, d=110, w=5, admitting that any three are given, the fourth is ſought?

77. At what diſtance from the fulcrum of a ſteel yard muſt a pound weight be ſuſpended, to balance 3 lb. 4 lb. 5 lb. *&c.* hung at 4 inches diſtance on the other?

78. A beam of 8 inches radius, winding a rope with a bucket round it, is driven by help of a wheel of 4 feet radius; what force will be neceſſary to raiſe a hhd of water, when a ſolid foot weighs 62½ lbs?

N. B. A heavy body falling from reſt will fall 16$\frac{1}{12}$ feet the firſt ſecond of time; and as 16$\frac{1}{12}$ ft : to the ſquare of 1 ſecond, :: ſo is the given diſtance : to the ſquare of the ſeconds required.

79. What ſpace will a heavy body, falling freely, paſs thro' in 9 ſeconds?

80. In what time would a ſtone falling from the top of a precipice 600 feet high reach the ground?

N. B. The degrees and effects of light, heat, and attraction, are reciprocally proportional to the ſquares of their diſtances from the centre whence they are propagated.

81. The diſtance of mercury from the ſun is accounted 32 millions of miles, of venus 59 mil. of the earth 81 mil. of mars 123 m. of jupiter 424 mil. of ſaturn 777 mil.; required the proportion of the ſun's light, heat, and attraction on all theſe bodies?

END OF PART FIRST.

PART II.

Containing Anſwers to the Queſtions in Part Firſt, with the principal ſteps of the more tedious operations.

Simple Addition.

1. 45293750
2. 258329412
3. 275849956926
4. 172486693
5. 467607538
6. 100615850
7. 364061525
8. 910634531
9. 10202566290
10. 715048145489126
11. 8959706158610
12. 98951852130430
13. 210229
14. 25124
15. 2024
16. 2024
17. 32209895
18. 5794
19. 1996
20. 26468
21. 237m.to.diſt.

Subtraction.

1. 4674
2. 51 and 38
3. 1732,1721
4. 7329
5. 2894
6. 1653
7. 1261
8. 271,875
9. 487
10. 1881
11. 1530
12. 999802151385

Multiplication.

78460839
23
235382517
156921678

1. 1804599297
2. 27535765810
3. 31624816
4. 53055442
5. 48964815
6. 37012312
7. 341591710
8. 659198664
9. 50205818
10. 29382630
11. 864472245
12. 69748500
13. 27633308592
14. 73997918611
15. 7425028227636
16. 2958421180572
17. 2408397120
18. 4822150080
19. 448349273425
20. 29062914930
21. 72027758680
22. 574585614865
23. 67254023544
24. 68118176511
25. 7378240711125
26. 456817937112
27. 549937660552
28. 3275126400000
29. 51643431600000
30. 3853670873940
31. 50594581803480
32. 326034810684
33. 59944850490
34. 264998300000

35. 2963100000000
36. 585433825241 58
7849687
6×3=18

47098122
3

1. 141294366
2. 16299552
3. 30329574
4. 47932390
5. 5299672
6. 41358060
7. 62913396
8. 7799936
9. 658538928
10. 874621260
11. 760070976
12. 1627531080

1. 7740 ſheaves
2. 2655 letters
3. 33984 legacy
4. 1872 y. inc.
5. 9648 fortune
6. 224 ſq. feet
7. 18480 ſtones
8. 666225000 grs
9. 56940 ſtr.
10. 31680 yards

Diviſion.

23)107615827(4678949
92
156
138
181
161
205
184
&c.

1. 4678949
2. 495108
3. $342926\frac{8}{26}$
4. 78460839
5. $8098754\frac{18}{19}$
6. 91468937
7. 78460839
8. $858850\frac{18}{79}$
9. 91468937
10. $3923244\frac{32}{89}$
11. 91468937
12. 91468937
13. $763973\frac{81}{98}$
14. $6801816\frac{760}{809}$
15. 91468379504
16. 6789456
17. 80455464^{220}
18. 247567
19. 317649
20. 2706915
21. 147678
22. 73581
23. 1711^{3055}
24. 1786^{913}
25. 899^{75424}
26. 764258
27. 5648736
28. 144171^{62}
29. 12076849
30. 1460900
31. 2768000
32. $4050010^{8596830}$
33. 207008009

$48\left\{\begin{array}{l}8)85536\\ \hline 6)10692\\ \hline \end{array}\right.$
1. 1782
2. $2074\frac{1}{2}$
3. $198\frac{5}{18}$
4. $17691\frac{5}{7}$
5. $457\frac{7}{8}$

6. $10313\frac{1}{9}$
7. 78504
8. 907356
9. 3891468
10. 7553344
11. 784689
12. 63425

1. 445l
2. 95 ſheets
3. 111 trees in each
4. $15\frac{2}{13}$l
5. 67l
6. 20 feet
7. 521
8. 8465

Reduction *.

1. 18712
2. 75156 g. 4s
3. 63519 j. 26s
4. 3557082 m. 7s 6d
5. 416896 j. 24s
6. 9441018180 f.
7. 98761653l
8. 1306247 h. g. 2s 6d
9. 104400000d
10. 63000 groats
11. 359 half-crown 2s 2d
12. 12797 g. 3s
13. 807735 g. 15s
14. 70177449 mar.
15. 544929486 j. 4s
16. 1579338 nob.
17. 861584 q. g. 4s
18. 5747881 h. g. 9s 6d
19. 19965 cr. 1s 8d
20. 16960 of each
21. 50004 nob. 54d
22. 348572 m.
23. 21519 mar. 5s
24. 670 nob. 6s 4d
25. 3456 of each

Weights and Meaſures.

1. 573440 dr.
2. 32625341 dr.
3. 975629 dr.
4. 1568 ounce
5. 6922 dr.
6. 501775 ounce
7. 18832 ton 16 cwt 2 qrs 18 lb. 13 ounce
8. 31 cwt 3 qrs 16 lb. 15 ounce 2 dr.
9. 31 cwt 1 qr 3 lb 1 ounce
10. 220 qr. 25 lb. 8 oz.
11. 1869 lb. 14 oz. 10 dr.
12. 2552 ton 6 cwt 15 lb. 12 oz.
13. 5760 gr.
14. 2793551 gr.
15. 5610552 gr.
16. 5301 gr.
17. 92 ounce
18. 86472 gr.
19. 192 lb.
20. 13 lb. 8 oz. 10 dwt 8 gr.
21. 854 lb. 6 dwt 3 gr.
22. 1015 oz. 12 dwt 8 gr.
23. 6243072 lb. 10 ounce
24. 6800 lb. 1 oz. 11 dwt
25. 5760 gr.
26. 3968657 gr.
27. 225888 ſcruples
28. 2730 lb. 10 oz. 5 dr. 1 ſcr.
29. 649 lb. 7 ounce 5 dr. 1 ſcruple 15 grains

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* *The twelve firſt examples are deſcending; that is, proceed from a greater name to a leſs, and are reverſed by the next twelve, which are aſcending.*

30. 95279 lb. 11 oz. 2 dr.
31. 119804 nails
32. 1764378 inches
33. 150 h. n.
34. 49042 yards 2 qrs
35. 49010½ yards
36. 1177109 qr 1 n.
37. 98083 yds 3 qrs
38. 44925 ells Engliſh
39. 59763 yards
40. 731708 ells Engliſh
41. 17537898 ells Fl.
42. 4979636 ells Fr. 4 qrs
43. 570240 b. c.
44. 1388930005672960 yds
45. 2233461 b. c.
46. 251982 m. 940 y. 1 in. 1 b.c.
47. 14945954 l. 1 m. 34 yds
48. 487294 m. 580 yds 2 f.
49. 748480 poles
50. 92577 poles
51. 3794802 yards
52. 76618 f.
53. 2993530 acres
54. 24686723 r. 26 poles
55. 4028238 r. 17 p. 3¼ yds
56. 849213 ac. 28 f. 8 ells
57. 381024 inches
58. 252 yards
59. 49312
60. 684 foot 128 inches
61. 11337408
62. 297 yards
63. 246691349 pun. 52 gal.
64. 180930 bar. 21 g.
65. 7571328 hhds
66. 74860 runlets
67. 5242 hds 36 gal.
68. 1266336 pints
69. 6030 hhds beer 12 gal.
70. 2304 pints
71. 7452 barrels
72. 13194 kild.
73. 6784 hhds
74. 18617 hds 30 gallons
75. 50182 gallons
76. 3136 qr. 3 pecks
77. 2449407 pints
78. 1715 qrs 6 buſh. 4 pints
79. 62204459 ſeconds
80. 8766 hours
81. 1893416220 thirds
82. 31557600 ſeconds
83. 6 y. 1 d. 10 h. 53 m. 45 ſ. 54 t.
84. 56449440000 ſeconds

Compound Addition.

1. 60l 8s 9d
2. 58l 19s 9¼d
3. 715l 10s 0d
4. 3997l 8s 11d
5. 668071 9s 8d
6. 55862l 0s 4d
7. 506501 6s 5¾d
8. 991531 10s 2¼d
9. 3099871 9s 0¼d
10. 12439541 19s 2d
11. 283 ton 8 cwt 1 qr
12. 117 lb. 7 oz. 5 dr.
13. 192 c. 3 q. 17 lb. 12 oz. 5 dr.
14. 293 lb. 5 oz. 7 dwt 4 gr.
15. 105 lb. 6 oz. 5 dwt 13 gr.
16. 49 lb. 7 dr. 2 ſcr.
17. 55 yds 2 qrs 2 nails
18. 43 l. 2 m. 1 f. 10 poles
19. 118 p. 3 yds 2 ft 10 in.
20. 120 acres 9 poles
21. 48 ac. 29 p. 10¼ yards
22. 80 qrs 4 buſhels 3 pecks
23. 32 ton 1 hd 42 g. 6 pts w.
24. 38 hds 14 g. 1 pint beer
25. 37 hds 40 gal. 1 qt ale
26. 721 days 5 h. 42 minutes
27. 82 ſto. 10 lb. 11 oz. 12 dr.

28. 38 ac. 3 r. 34 f. 4 ells
29. 46 chal. 7 bolls
30. 35 g. 4 pts 1 mutchkin
31. 4270l 1s
32. 3516l 12s 11d
33. 2862 yds 1 qr 1 nail
34. 12l 6s 5$\frac{1}{4}$d
35. 3296l 18s 8$\frac{1}{4}$d
36. 764l 9s
37. 966l 2s 5d
38. 3223l 18s 11d
39. 8884l 1s 7d
40. 11169 c. 1 q. 14 lb. 1 oz. 14 d.
41. 1750l 4s 3d
42. 77 lb. 8 dwt 18 gr.
43. 3721 acr. 2 rood 10 poles
44. 200 m. 5 f. 34 p. 5 yards total diſtance.

Compound Subtraction.

1. 6478l 13s 8$\frac{1}{2}$d — 517l 19s 4$\frac{3}{4}$ = 5960l 14s 3$\frac{3}{4}$d
2. 1462 5 0 — 644 7 6 = 817 17 6
3. 7338 6 2$\frac{1}{2}$ — 4143 4 9$\frac{1}{2}$ = 3195 1 5
4. 2988 7 7 — 1232 10 4 = 1755 17 3
5. 89 lb. 7 oz. 3 d. 3 g.—89 lb. 5 oz. 19 d. 15 g.=1 oz. 3 d. 12
6. 32 lb.—29 lb. 6 oz. 4 dwt 21 gr.=2 lb. 5 oz. 15 dwt 3 gr.
7. 14 cwt 2 qrs 20 lb.—11 1 8 9 2=3 c. 1 q. 11 lb. 6 oz. 14.
8. 1272 7 1$\frac{1}{2}$ — 838 8 3 = 433 18 10$\frac{1}{2}$
9. 3465 ac.— 3199 acres 1 rood = 265 acres 3 roods
10. 347 hds 41 g.—240 hds 38 g. = 107 hds 3 gallons
11. 197 hds 17 g.— 116 hhds 16 g. 4 pts = 81 hhds 4 pts
12. 4122 19 6 — 445 0 0 = 3677 19 6
13. 5462 2 0 — 2022 4 5 = 3439 17 7
14. 58 cwt 1 qr 27 lb.—6 cwt 2 lb. = 52 lb. 1 qr 25 lb.
15. 257 cwt 25 lb.— 8 cwt 3 qrs 15 lb. = 248 c. 1 q. 10 lb.

Compound Multiplication.

1. 12l 19s 10$\frac{1}{2}$d
2. 37 13 5
3. 449 13 9
4. 6 1 2$\frac{1}{4}$
5. 144 7 4
6. 159 15 2$\frac{1}{4}$
7. 132 16 0$\frac{1}{2}$
8. — 4 4$\frac{1}{4}$
9. 60 2 6
10. 87 0 3$\frac{3}{4}$
11. 3 7 4$\frac{1}{2}$
12. 198 3 10$\frac{3}{4}$
13. 840 11 6
14. 803 7 4
15. 9 16 8
16. 491 17 0
17. 812 15 0$\frac{1}{4}$
18. 695 8 0

1. 68 cwt 3 qrs 22 lb.
2. 174 lb. 2 oz. 7 dr.
3. 219 lb. 8 oz. 9 dwt 12 g.
4. 899 lb. 8 oz. 4 dr.
5. 151 ton 2 cwt
6. 79 lb. 1 oz. 15 dr.
7. 79 lb. 8 oz. 9 dwt 6 gr.
8. 381 m. 9 p. 4$\frac{1}{2}$ yard
9. 393 hds 41 gallons
10. 23 buſh. 1 p. 6 pts
11. 599 hhds 40 gallons
12. 31 y. 5 m. 21 days

13. 21 d. 15 h. 50 min.
14. 134 ac. 3 r. 31 poles
15. 94 ac. 1 r. 34 poles
16. 4382 d. 21 h. 47 m. 24 ſe.
17. 927 hds 43 gallons
18. 664 hds 19 gal. 4 pts

Rule 2d.

1. 11341 13s 1½
2. 351 13 9
3. 498 13 6
4. 1255 10 0
5. 50 4 6
6. 3 4 6
7. 570 0 0
8. 451 0 0
9. 579 10 3
10. 825 12 0
11. 3279 1 3
12. 83 18 3
13. 255 3 0
14. 1344 12 0
15. 655 10 2
16. 907 4 0
17. 2817 12 0
18. 2898 0 0
19. 568 c. 1 qr 16 lb.
20. 409 lb. 6 oz. 8 dr.
21. 1621 lb. 4 oz. 15 d. 13 grs

Rule 3d.

3 7 0¼
4×4+1=17
13 8 1
4
53 12 4
3 7 0¼

1. 561 19 4¼
2. 92 6 8½
3. 287 2 6¾
4. 19 12 0¾
5. 984 0 8
6. 4596 3 2¾
7. 1213 15 8
8. 2093 15 5¼
9. 34 10 3¾
10. 55 4 4½
11. 3635 12 8
12. 1155 19 0
13. 5281 6 8
14. 2458 13 0
15. 1176 14 0

Rule 4th.

1. 20162 19 6
2. 345772 11 6
3. 394643 15 0
4. 13738 1 8½
5. 492710 1 8
6. 799993 6 0
7. 157365 5 10½
8. 10709 2 3
9. 170058 17 11
10. 4034 5 4
11. 2771 2 1½
12. 3214 7 2¼

Practical Questions.

1. 35 8 9
2. 6 10 6¼
3. 7 7 4¼
4. 10 12 6
5. 7 8 5¼
6. 9 16 10½
7. 10 1 2½
8. 24 14 2
9. 42 9 6
10. 61 16 4½
11. 78 19 4½
12. 78 1 4
13. 91 5 4½
14. 100 13 11½
15. 145 17 6
16. 223 9 9
17. 55 8 1½
18. 223 3 9
19. 122 0 2½
20. 199 5 6
21. 153 11 7
22. 20 9 0¾
23. 306 18 1½
24. 37 16 2
25. 3 17 6
26. 5 3 1½
27. 76 18 3
28. 40 5 0
29. 78 14 2
30. 27 4 6
31. 28 1 9
32. 100 5 11½
33. 410 0 6
34. 2127 11 4
35. 23 4 9½
36. 3 15 3
37. 46 8 9¾
38. 56 14 6½
39. 413 18 10½
40. 148 18 1½
41. 75 12 0
42. 20 13 3
43. 123 4 7
44. 6 19 0¾
45. 988 11 10½
46. 69 5 5
47. 172 19 6
48. 123 5 0
49. 312 cwt 2 qrs 17 lb. 6 oz. 3 dr.
50. 292 lb. 9 oz. 6 dt
51. 163 lb. 11 oz. 14 dwt 9 gr.

52. 13 lb. 4 oz. 5 dr. 19 gr.
53. 10 lb. 10 oz. 12 d. 6 gr.
54. 79 p. 5 yds 1 foot
55. 428 ac. 1 r. 5 p. 19 yds
56. 459 qrs 5 b. 3 pecks
57. 1452 ton 54 g. 1 pint
58. 171116 hds 30 g. 3 p. beer
171153 hds 30 g. 3 pts ale
59. 1620 m. 2 f. 14 poles
60. 17 y. 11 m. $25\frac{1}{2}$ days

Compound Diviſion.

1. 14l 9s $8\frac{1}{4}$
2. 5 12 11
3. 159 14 8
4. 14 12 7
5. 7 16 $6\frac{1}{4}$ $\frac{1}{7}$
6. 11 9 $2\frac{1}{2}$
7. 149 17 11
8. 0 17 $3\frac{3}{4}$
9. 62 7 $2\frac{1}{2}$
10. 21 15 $0\frac{1}{4}$
11. 0 13 8
12. 6 14 4
13. 1 8 $5\frac{1}{2}$ $\frac{1}{3}$
14. 73 17 $8\frac{3}{4}$
15. 0 14 11

16. 29 lb. 8 oz. 1 dwt 18 gr.
17. 5 lb. 8 oz. 2 dr.
18. 1 lb. 11 oz. 7 dr. 1 ſc. 14 gr.
19. 14 yds 2 qrs 3 nails
20. 21 lb. 3 oz. 19 dwt 10 gr.
21. 17 yds 2 feet 11 inches
22. 17 yds 2 ft 11 in. 2 b. c.
23. 17 m. 3 fur. 14 poles
24. 14 yds 2 qrs 3 nail
25. 7 hds 62 g. 7 pts wine
26. 7 hds 13 g. 7 pints
27. 7 cwt 2 qrs 18 lb.
28. 15 lb. 3 oz. 5 dr.
29. 6 lb. 2 oz. 7 dr. 2 f. 10 g.
30. 4 ac. 2 roods 7 poles,
31. 37 ton 15 cwt 2 qrs
32. 15 lb. 13 oz. 3 dr.

1. 1l 1s $7\frac{1}{4}$ $\frac{11}{17}$
2. 1 4 0
3. 0 8 $0\frac{1}{4}$
4. 0 11 $0\frac{1}{4}$
5. 0 17 $8\frac{3}{4}$
6. 4 8 $1\frac{5}{38}$
7. 6 8 $9\frac{3}{4}$ $\frac{5}{13}$
8. 14 9 10
9. 4 16 $3\frac{1}{2}$
10. 6 12 $1\frac{1}{4}$
11. 6 8 $5\frac{1}{4}$
12. 10 14 3
13. 5 7 $6\frac{3}{4}$
14. 1 10 $0\frac{3}{4}$ $\frac{31}{79}$
15. 9 9 $5\frac{1}{2}$
16. 11 8 $3\frac{1}{2}$ $\frac{22}{49}$
17. 3 4 $0\frac{1}{4}$
18. 0 18 $9\frac{3}{4}$
19. 0 17 $11\frac{1}{2}$
20. 12 18 $11\frac{1}{2}$
21. 0 13 $7\frac{1}{4}$

22. 21 lb. 3 oz. 15 dwt 21 gr.
23. 17 yds 2 ft 11 in. 2 b. c.
24. 17 m. 3 f. 14 poles
25. 7 hds 31 g. 3 pts wine
26. 14 yds 2 qrs 3 nails
27. 5 acres 3 roods 7 poles

Rule 2d.

1. 0l 6s 1d
2. 1 16 1
3. 0 15 $8\frac{1}{2}$ $\frac{2}{3}$
4. 9 1 2
5. 4 18 $6\frac{1}{2}$
6. 166 1 $5\frac{3}{4}$ $\frac{3}{11}$
7. 8 8 0
8. 0 15 9
9. 0 4 $11\frac{1}{2}$
10. 1 4 $10\frac{1}{4}$
11. 0 1 $10\frac{1}{2}$
12. 0 7 $10\frac{1}{2}$
13. 2 14 0
14. 1 1 4
15. 3 2 0
16. 1 11 6
17. 1 16 0
18. 0 18 $11\frac{1}{2}$
19. 0 18 0
20. 0 7 6
21. 0 1 $10\frac{3}{4}$
22. 0 5 6
23. 0 4 10
24. 0 3 $9\frac{1}{2}$

25. 7 hds 31 gal. 3 pts wine
26. 21 lb. 3 oz. 15 dwt 21 gr.
27. 17 yds 2 ft 11 in. 2 b.c.
28. 17 m. 3 f. 14 poles
29. 5 acres 3 roods 7 poles

Practical Queſtions.

1. 0l 7^s $8\frac{3}{4}$ $\frac{1}{11}$
2. 0 7 $8\frac{3}{4}$
3. 0 14 $8\frac{1}{4}$
4. 0 19 $4\frac{1}{2}$
5. 7 cwt 2 qrs 18 lb.
6. 123 6 8
7. 125 9 0
8. 3^s 4^d a w. ſhare
   10s a man's do.

Exerciſes.

1. 182 8s
2. 22521 18s 6d
3. 4308 guin. 7 ſh.
4. 449202 dollars
5. 701111½ yds
6. 2937 p. 5s 6d
7. 6175 dollars
8. 12250 florins

$$\begin{array}{rrr} 194 & 8 & 0 \\ 86 & 8 & 0 \\ 193 & 1 & 0 \\ 264 & 12 & 0 \\ 51 & 1 & 3 \\ 23200 & 0 & 0 \\ \hline 9.\ 23989 & 10 & 3 \end{array}$$

10. 83 lb. 1 oz. 2 d.
11. 110 hhds
12. 240 caniſters
13. 1416430800 el.
14. 4755801600 b.c.
15. 1295827038 b.c.
16. 66 of each
17. 232 qrs 2 b. 2 p.
18. 88 days

19. 137280 times
20. 6911136 letters

$$\begin{array}{llll} & 69 \text{ cwt} & 3 \text{ qrs} & 20 \text{ lb. groſs} \\ & 4 & 0 & 14 \text{ tare} \\ \hline 21. & 65 & 3 & 6 \text{ nett} \end{array}$$

22. 10s $5\frac{3}{4}$d a child's ſhare
23. 196 $\frac{143536}{258224}$ ſaturn
    3078 $\frac{826722}{1978501}$ mars
24. 1 cwt 1 qr 17 lb.

$$\begin{array}{llll} & 5 \text{ lb.} & 4 \text{ oz.} & 16 \text{ dwt} \\ & 2 & 2 & 2 \\ & 4 & 7 & 8 \\ & 3 & 11 & 6 \\ \hline 25. & 16 & 1 & 12 \end{array}$$

26. 3 cwt 1 qr 26 lb.
27. 24 cwt 1 qr 21 lb.
28. 172 cwt nett
29. 309 cwt 17 lb. 13 ounce
30. 32 cwt 3 qrs 25 lb. 12 oz.
31. 14s $6\frac{1}{2}$d *per* yard
32. 4 $4\frac{1}{2}$ $\frac{5}{6}$ *per* yard
33. 3 11 gain
34. 6 11 1 *per annum*
35. 11 8 $1\frac{1}{2}$ *per annum*
36. 11 1 0 gained
    1 7 $4\frac{1}{26}$ ſpends *per* week
37. 574 12 6
38. 87 3 9
39. 59635 6 0

Simple Proportion.

1. 17 y : 85^s :: 307 : $\frac{307\times85}{17}=\frac{26095}{17}=1535^s=76l\ 14s$
2. 7 y : 126d :: 99 : $\frac{12474}{7}$ = 1782d = 7l 8s 6d
3. 100 y. : 1300 d. :: 37 y. : $\frac{48100}{100}$ = 481 d. = 2l 1d
4. 68 y. : 4318 d. :: 7 y. : 30226 = 444 d. = 1l 17s 0½d
5. 228 qrs : 171 ſ. :: 395 qrs : 67545 = 14l 16s 3d

6. 19 lb. : 95 f. :: 353 lb. : ^{33535} = 1765 = 88l 5s
7. 47 y. : 33135 f. :: 117 y. : ^{3876795} = 82485 = 85l 18s $5\frac{1}{4}$d
8. 57 y. : 53010 f. :: 152 y. : ^{8057520} = 141360 = 147l 5s
9. 41 hhds : 275643 f. :: 33 hhds : ^{9096219} = 221859 = 231l 2s $0\frac{3}{4}$d
10. 51 lb. : 18819 f. : : 2156 lb. : ^{40573764} = 795564 = 828l 14s 3d
11. 837900 f. : 1652 lb. :: 7125 f. : ^{420375} = $14\frac{1}{21}$ lb.
12. 525 f. : 14 lb. :: 9450 f. : ^{132300} = 252 = 2 cwt 1 qr
13. 45180 f. 30 cwt :: 1779 f. : ^{53370} = 1 cwt $20\frac{76}{251}$ lb.
14. 365 d. : 8929 d. :: 73 d. : ^{651817} = 7l 8s $9\frac{3}{4}$d $\frac{1}{5}$
15. 17 y. : 4798 f. :: 75 y. : ^{359830} = $21167\frac{11}{17}$ = 22l $11\frac{3}{4}$d $\frac{11}{17}$
16. 100 qrs : 350 d. :: 285 qrs : ^{99750} = 4l 3s $1\frac{1}{2}$d
17. 84 qrs : 172 ſ. :: 38 qrs : ^{6536} = 3l 17s $9\frac{1}{2}$d $\frac{6}{7}$
18. 141 qrs : 4856 d. :: 1224 qrs : ^{5943744} = 175l 12s $10\frac{10}{47}$d
19. 4 qrs : 23 f. :: 354 qrs : ^{8142} = $2035\frac{1}{2}$ = 2l 2s $4\frac{3}{4}$d $\frac{1}{2}$
20. 18 lb. : 738 f. :: 6370 lb. : ^{4701060} = 261170 = 272l 1s $\frac{1}{2}$d
21. 54 g. : 1039 d. :: 3031 g. : ^{3149209} = 242l 19s $10\frac{1}{2}$d $\frac{20}{27}$
22. 160 p. : 6450 d. :: 33135 p. : ^{213720750} = 556l 12s $10\frac{1}{2}$d $\frac{3}{4}$
23. 256 p. : 1762 f. :: 24583 p. : ^{43315246} = 176l 5s $0\frac{0}{4}$ $\frac{23}{128}$d
24. 84 g. : 756 ſ. :: 17 g. : ^{12852} = 153 ſ. = 7l 13s
25. 1440 dwt : 378 f. :: 6825 dwt : ^{2579850} = 89l 11s $6\frac{3}{4}$d
26. 49 g. : 990 d. :: 574 g. : ^{568260} = 48l 6s $5\frac{1}{7}$d
27. 11 lb. : 210 f. :: 886 lb. : ^{186060} = 17l 12s $4\frac{1}{2}$d $\frac{6}{11}$
28. 7 lb. : 3234 f. :: 1707 lb. : ^{5520438} = 821l 9s $10\frac{1}{2}$d
29. 17 lb. : 85 d. :: 352 : ^{29920} = 7l 6s 8d
30. 28 ft. : 13307 far. :: 6384 ft. : 3033996 f. = 3160l 8s 3d
31. 72 m. : 108 d. :: 42 m. : 63 days
32. 9 d. : 18 m. :: 4 d. : 8 men
33. 37 m. : 156 d. :: 57 m. : $240\frac{12}{37}$ days
34. 9 d. : 28 p. :: 36 d. : 112 perſons
35. 45 d. : 54 oz. :: 48 d. : 4 lb. 9 oz. 12 dwt
36. 648 dwt : 54 d. :: 720 dwt : 5s
37. 8 m. : 2000 men :: 6 m. : 1500 men
38. 1925l : 9 m. :: 275l : 1 m. 1 w. 1 day
39. 3575 : 18150s :: 39 : 198s = 9l 18s
40. 58 oz. : 5974 d. :: 12 oz. : 1236 d. = 5l 3s
41. 4 : 1158 d. :: 105 : 126l 13s $1\frac{1}{2}$d
42. 25 ſ. : 3 lb. :: 34 ſ. : 4 lb. 19 dwt $4\frac{4}{5}$ gr.
43. 1l 17s 6d 44. 2689l 17s 45. 2700 men 46. 735l
47. 400 men 48. 30 yards 49. 59l 10s 50. 10s 6d

51. 13 oz. 6 dwt 16 gr. 52. 9 m. 18 days. 53. 87l 10s
54. 6l 8s $5\frac{3}{4}$d $\frac{3}{5}$ 55. 26l 56. 10s $2\frac{1}{4}$d $\frac{3}{5}$ 57. 9l 7s 6d
58. 425l pr : 4845 d. int. :: 100l pr. : 4l 15s
59. 200 ſixp. : 100l :: 2571 ſixp. : 1285l 10s
60. 6 m. : 125l :: 8 m. : 166l 13s 4d
61. 432 ft : 342 ſ. :: 660 ft : 26l 2s 6d
62. 30 threep. : 81 yds :: 21 threep. : 56 y. 2 qrs $3\frac{1}{5}$ nails
63. 369 f. : 1 yd :: 18819 f. : 51 yds
64. 78 m. : 678 qrs :: 130 m. :: 1130 qrs = 282 cwt 2 qrs
65. 128 yds : 32 d. :: 64 yd : 1s 4d
66. 210 cwt : 120 m. :: 60 cwt : $34\frac{2}{7}$ miles
67. 15 ſixp. : 9s :: 5 ſixp. : 3s
68. 15 ſixp. : 756 yds :: 10 : 504 yds
69. 3 qrs : 90 yds : 5 : 150 yards
70. 9 ſixp. : 84 yds :: 15 ſixp. : 140 yards
71. 5 ſec. : 36 yds :: 3600 ſec. : 25920 yds
72. (378 g.—42g.) 336 g. : 3213 ſ. :: 84 gal. : 40s 3s 3d
73. 24 y. : 36 ſ. :: 141 y. : $\frac{36\times141}{24}=\frac{3\times141}{2}=\frac{423}{2}=$ 10l 11s 6d

Compound Proportion.

1. 12 : 100 : 5 :: 1650 : 42 : $\frac{5\times1650\times42}{12\times100}=\frac{1155}{4}=$ 288l 15s
2. 365 d. : 100l pr. : 5l int. :: 675l pr. : 438 d. : 40l 10s
3. 15 m. : 27 d. : 37 r. :: 63 d. : 74 m. : $425\frac{41}{45}$ roods
4. 15 d. : 84 m. : 72 ac. :: 96 m. : 12 d. : 65 ac. 3 r. $12\frac{4}{7}$ p.
5. 18 m. : 600l : 45l :: 100l : 12 m. : 5l
6. 365 d. : 100l : 5l :: 650l : 173 d. : 15l 8s $\frac{3}{4}$d $\frac{69}{73}$
7. 52 w. : 100l : 5l :: 375l : 37 w. : 13l 6s $9\frac{3}{4}$d $\frac{9}{11}$
8. 39 w. : 175l : 5670 f. :: 100l : 52 w. : $4\frac{1}{2}$l *per cent.*
9. 146 d. : 200l : 56s :: 100l : 365 d. : $3\frac{1}{2}$l *per cent.*
10. 5 y. : 150 ſixp. : 100l :: 352 ſixp. : 1 y. : 470l principal
11. 975l : 1040 d. : 1 y. :: 45630 d. : 100l : $4\frac{1}{2}$ years
12. 108 d. : 236 m. : 160 qrs :: 76 m. : 432 d. : $206\frac{6}{59}$ qrs
13. 8 h. : 12 d. : 360 m. :: 60 d. : 6 h. : 1350 miles.
14. 30 m. : 8 h. : 36 d. :: 12 h. : 24 m. : $43\frac{1}{5}$ days
15. 435 thr. : 90 cwt : 15 m. :: 30 cwt : 2320 th. 26 m. $5\frac{1}{3}$ f.
16. 9 d. : 9 oz. : 10 ſ. :: 36 oz. : 1 d. : 4s $5\frac{1}{4}$d $\frac{1}{3}$
17. 3 in. : 16 in. : 12 in. :: 12 in. : 12 : 36 inches
18. : 18s : 3d : 18 m. : 16s :: 45 m. : 27d : 15s : 15l

19. 6 h.: 30 yds : 12 m.: 12 d.: 8 m.:60 yds : 8 h.: $21\frac{1}{3}$ days
20. 12 : 24 d.: 12 : 12 : 3 : 60 :: 4 : 20:18 ; 18 : 8 : 100 ft

Practice, Rule 1ſt,

1. 77 19 6
2. 187 7 $8\frac{1}{2}$
3. 309 18 2
4. 467 18 $10\frac{1}{2}$
5. 730 9 4
6. 9820 18 6
7. 812 8 8
8. 2175 1 6
9. 24937 0 0
10. 26189 0 0
11. 3668 10 0
12. 2743 0 0
13. 11458 0 0
14. 9362 0 0
15. 7841 12 0
16. 6180 13 4
17. 39 7 2
18. 70 6 2
19. 40 18 8
20. 182 19 6
21. 699 11 4
22. 2292 3 6
23. 445 18 6
24. 4958 0 0
25. 2447 16 8
26. 1640 11 8
27. 1173 10 0
28. 15749 16 0
29. 4729 0 0
30. 12494 0 0
31. 164 8 1
32. 7486 8 0
33. 728 18 0
34. 9335 17 6
35. 2615 6 8
36. 15244 13 4
37. 6247 0 0
38. 1493 12 0
39. 45733 10 0
40. 622 7 10
41. 521 1 9
42. 619 2 0
43. 593 14 0
44. 18329 12 0

Rule 2d,

48469
5
12)242345
2.0)20195 5
1009 15 5
or,
4d$=\frac{1}{3}$ 48469
1$=\frac{1}{4}$ 16156 4
4039 1
2.0)20195 5
1. 1009 15 5
2. 2178 6 3
3. 3224 18 8
4. 1865 11 0
5. 1734 15 0
6. 343 0 4
7. 12701 14 0
8. 12506 2 0
9. 5213 12 0
10. 16677 12 0
11. 6607 16 0
12. 53280 14 0
13. 50804 8 0
14. 4853 11 0
15. 1027 12 0
16. 5886 15 0
17. 5971 4 0
18. 1336 10 0
19. 70949 16 0
20. 3204 0 0
21. 34237 0 0
22. 95469 0 0
23. 1924 0 0
24. 41 10 1
25. 330568 0 0
26. 1622 17 4
27. 3691 13 0
28. 1489 6 8
29. 2894 5 8
30. 99148 0 0
31. 10970 8 0
32. 31995 12 0
33. 44435 14 0
34. 13666 8 0
35. 3936 3 4
36. 54878 8 0
37. 26941 4 0
38. 47488 14 0
39. 28111 10 0
40. 75789 8 0
41. 73474 4 0
42. 65571 4 0

Rule 3d.

1. 273 8 $5\frac{1}{4}$
2. 151 18 $0\frac{1}{4}$
3. 127 11 $11\frac{1}{4}$
4. 139 16 9
52. 310 15 0

6. 683 13 0
7. 568 6 4
8. 306 0 4
9. 1467 15 0
10. 298 16 2½
11. 632 15 6
12. 1335 17 2
13. 1244 2 4½
14. 651 13 7½
15. 1049 2 2¾
16. 1944 19 5¾
17. 2622 11 9
18. 2633 17 0
19. 510 4 4½
20. 1055 12 6
21. 2181 12 6
22. 1673 12 3¾
23. 574 15 6½
24. 3550 1 10½
25. 542 18 8¾
26. 1115 4 5
27. 2289 2 9
28. 605 1 10
29. 309 18 6
30. 1903 16 6
31. 688 9 0¾
32. 1407 10 1
33. 2157 3 0¾
34. 4566 7 10
35. 220 0 0
36. 2912 10 6
37. 458 5 0
38. 435 8 0
39. 13804 14 2½
40. 17370 14 9
41, 57780 15 9
42. 12230 15 3½
43. 6947 16 10¼
44. 8191 10 8
45. 17866 0 4
46. 4934 6 9½
47. 30524 2 8
48. 16065 6 8
49. 9463 9 8½
50. 7345 1 0
51. 6014 18 4
52. 4526 18 9½
53. 238286 13 4
54. 1619522 0 0
55. 909506 6 0
56. 36373 4 0
57. 33391 6 6
58. 306814 8 0
59. 139089 10 0
60. 28316 18 8

Rule 4.

2q.=½ 3l 18s 6d
6×3
23 11 0
70 13 0
1q.=½ 1 19 3
4lb.=⅐ 0 19 7½
0 2 9½

1. 73l 14s 8d
2. 101 6 7
3. 43 6 6
4. 72 19 9½
5. 19 8 10
6. 6 18 5¼
7. 282 2 1¾
8. 164 4 4
9. 38 14 1½
10. 3633 13 9¼
11. 1 0 9¼
12. 0 9 11
13. 2083 15 10
14. 2420 10 8½
15. 19 19 2¾
16. 19 19 2½
17. 7 12 6
18. 76 13 8¾
19. 19 2 8
20. 223 7 7½
21. 414 6 0
22. 196 14 9½
23. 160 10 2
24. 219 15 6
25. 1216 15 4
26. 379 7 0¼
27. 12 3 6½
28. 15 4 5¼
29. 142 8 2¾
30. 36 6 3
31. 104 14 9
32. 46 13 9¾
33. 732 5 10
34. 672 19 9¾
35. 3043 5 10½
36. 398 9 6
37. 2553 6 10¼
38. 892 7 10½
39. 767 7 7¾
40. 634 7 6
41. 637 15 10¾
42. 8347 15 7½

Exercises.

1. 375 19 1
2. 38588 4 0
3. 8310 4 7
4. 843 10 0
5. 7174 17 8
6. 38664 0 2½
7. 26624 2 6
8. 4244 8 0
9. 638 3 10½
10. 304 1 11¾
11. 5327 7 0
12. 7107 9 3
13. 2448 15 0
14. 1943 3 2½
15. 126 8

16. 18 6 1¾
17. 415 15 0¾
18. 2668 18 9¾
19. 3612 11 2
20. 4333 14 4
21. 410 cwt 1 qr 3½ lb.
22. 270 cwt 2 qrs 10 lb.
23. 832 cwt 1 qr 11 lb.
24. 618 cwt 1 qr 6 lb. 8 oz.
25. 273 cwt 2 qrs 23 lb. 10 oz.
26. 372 cwt 11 lb. 10 oz.
27. 56 cwt 3 qrs 27 lb.
28. 284 cwt 9 lb. 2 oz. 6 dr.
29. 26 cwt 1 qr
30. 141 cwt 3 qrs
31. 105 cwt 3 qrs 4 lb. 9 oz. 3 dr.
32. 136 cwt 8 lb. 11 oz. 3 dr.
33. 12 cwt 22 lb. trett
34. 1 cwt 12 lb.
35. 2 cwt 3 qrs 16 lb. 14 oz. 12 dr.
36. 3 cwt 2 qrs 25 lb. 4 oz. 14 dr.
37. 2 qrs 1 lb. cloff.
38. 1 qr 8 lb. 5 oz. 5 dr.
39. 26 lb. 5 oz. 5 dr.

16 lb. $=\frac{1}{7}$ 6786 2 groſs
2 $=\frac{1}{8}$ 969 2
121 0 21
1090 2 21 tare
26) 5695 3 7 t. ſut.
219 8
168) 5476 2 27 tr. ſut.
32 2 11 cloff
40. 5444 0 16 net weight.

16 lb. $=\frac{1}{7}$ 118 cwt 1 qr groſs
4 $=\frac{1}{4}$ 16 3 18
4 0 25
21 0 13 tare
26) 97 0 15 t. ſut.
3 2 26 tret
168) 93 1 17 t. ſut.
0 2 6 cloff
41. 92 3 11 nett wt

8 $=\frac{1}{14}$ 66 0 8 groſs
4 $=\frac{1}{2}$ 4 2 24 9
2 1 12 5
7 0 8 14 tare
26) 58 3 27 2 t. ſut.
2 1 2 2 trett
168) 56 2 25 0 t. ſut.
0 1 9 13 cloff
42. 56 1 15 3 nett wt.

Bills of Parcels, &c.

(1.)	(2.)	(3.)	(4.)
5 9 4	2 2 9	5 5 9	24 1 3
4 9 10	1 3 11	6 13 2	20 14 2
10 7 7½	5 10 8	19 19 0	28 10 6¾
9 11 0	3 8 0	11 12 11	7 1 10
1 18 3	2 0 6	19 18 9	2 1 7½
20 13 4	2 7 3	1 13 3	6 2 3¾
£.52 9 4½	£.16 13 1	£.65 2 10	£.88 11 9

	£.	s.	d.		£.	s.	d.		£.	s.	d.		£.	s.	d.
(5.)	56	2	0	(6.)	39	12	0	(7.)	140	0	0	(8.)	44	11	1
	31	1	0		72	10	0		105	17	6		99	10	7½
	15	4	0		128	12	6		85	6	3		63	8	5¼
	100	15	0		33	15	0		44	3	4		359	0	4½
	17	4	0		19	12	0		55	19	6¼		70	8	4
	19	11	6		47	5	0		11	9	2		142	16	0
	6	2	6		19	8	8		19	17	6		206	12	8¼
£.	246	0	0	£.	360	15	2	£.	462	13	3¼	£.	986	7	6½

(9.)	16	1	9¾	(10.)	75	1	0½	(11.)	175	1	1½
	25	14	8¼		88	2	2		167	15	1½
	42	11	8½		521	12	6		158	3	7¾
	14	15	11		255	1	3		197	10	7½
	111	0	7½		364	19	2		237	17	1
	9	9	0		307	2	11		195	12	1¾
	23	10	3¾		180	7	6		191	0	9½
	86	11	4		169	6	3		384	15	10½
£.	329	15	4¾	£.	1961	12	9½	£.	1707	16	5

(12.)	94	8	3¾	(13.)	668	10	0	(14.)	62	3	10½
	20	6	3		440	4	3		30	3	9½
	139	4	4½		56	13	0¼		10	17	1¼
	215	9	3¼		192	5	10		105	16	0¼
	60	0	11¼		153	2	6		632	11	6½
	143	18	9		46	11	7¾		632	6	0½
	238	19	0		27	15	9		47	5	8½
	5	19	0		379	11	7¼		257	5	0
	7	12	0		20	11	10		32	10	0
	40	2	1		3	2	10¼		11	10	0
£.	965	19	11¾	£.	1988	9	3½	£.	1822	9	1

Vulgar Fractions.

Prob. 1. $\frac{4}{11}$, $\frac{3}{10}$, $\frac{523}{6452}$, $\frac{4332}{4493}$, $\frac{148}{1735}$, $\frac{191}{1310}$, $\frac{161}{432}$, $\frac{3}{4}$, $\frac{5}{6}$.

Prob. 2. $4\frac{3}{8}$, $=\frac{4\times8+3}{8}=\frac{35}{8}$.

Prob. 3. $\frac{35}{8}=35\div8=4\frac{3}{8}$.

Prob. 4. $\frac{3}{8}$ of $\frac{4}{15}=\frac{3}{8}\times\frac{4}{15}=\frac{3}{2}\times\frac{1}{15}=\frac{1}{2}\times\frac{1}{5}=\frac{1}{10}$. $\frac{5}{112}$, $\frac{10}{7}$ or $1\frac{3}{7}$, $\frac{36}{95}$, $\frac{15}{44}$.

Prob. 5. $\left.\begin{matrix}7\times6=42\\5\times8=40\end{matrix}\right\}$ The new numerators; and $6\times8=48$, the common denominator.

(2.) $\frac{12}{24}\,\frac{8}{24}\,\frac{18}{24}=\frac{6\ 4\ 9}{12}$. (3.) $\frac{3600}{4320}$, $\frac{3780}{4320}$, $\frac{3840}{4320}$, $\frac{3888}{4320}$. (4.) $\frac{819\ 1144\ 594}{1287}$. (5.) $\frac{1496}{2805}$, $\frac{1980}{2805}$, $\frac{2295}{2805}$. (6.) $\frac{6864}{25740}$, $\frac{23595}{25740}$, $\frac{5940}{25740}$, $\frac{2340}{25740}$. (7.) $\frac{7140}{8925}$, $\frac{3825}{8925}$, $\frac{7735}{8925}$, $\frac{8400}{8925}$. (8.) $\frac{540}{1440}$, $\frac{800}{1440}$, $\frac{216}{1440}$*.

Prob. 6. The queſtions having the ſame number are the reverſe of each other; and the examples under the note are reverſed by thoſe under Prob. 7th.

Follows the ſolution of the firſt queſtion of each:

$\frac{4}{9}$ farthing reduced to the fraction of a pound $=\frac{4}{9}\times\frac{1}{4}\times\frac{1}{12}\times\frac{1}{20}=\frac{4}{8640}=\frac{1}{2160}$l, and $\frac{1}{2160}$l reduced to the fraction of a farthing $=\frac{1}{2160}\times\frac{20}{1}\times\frac{12}{1}\times\frac{4}{1}=\frac{4}{9}$ farthing.

Next, $\frac{4}{5}$l reduced to the fraction of a guinea $=\frac{4}{5}\times\frac{20}{21}=\frac{16}{21}$ guinea, &c.

Laſtly, 7d reduced to the fraction of a pound $=\frac{7}{1}\times\frac{1}{12}\times\frac{1}{20}=\frac{7}{240}$, &c.

ADDITION.

(1.) $\frac{637+504+624}{728}=\frac{1765}{728}=2\frac{309}{728}$. (2.) $\frac{5+6+8}{11}=\frac{19}{11}=1\frac{8}{11}$†

(3.) $2565+6460+2907+4590=\frac{16522}{14535}=1\frac{1987}{14535}$.

(4.) $9384+8177+11914=\frac{29475}{14467}=2\frac{541}{14467}$.

(5.) $231+160=\frac{391}{440}$.

(6.) $2574+2783+4140=\frac{9497}{4554}=2\frac{389}{4554}$.

(7.) $45360+48384+24960+16200=\frac{134904}{51840}=2\frac{1301}{2160}$.

(8.) $1292+2508+2431=\frac{6231}{3553}=1\frac{2678}{3553}$.

(9.) $14364+5720=\frac{20084}{11115}=1\frac{8969}{11115}$.

(10.) $4+7+8+1\frac{19}{30}=20\frac{19}{30}$.

(11.) $9+6+8+11+\frac{7}{12}=34\frac{7}{12}$.

(12.) $924+288+352+792=\frac{2356}{1056}=2\frac{61}{264}$, then $6+14+51+2\frac{61}{264}=73\frac{61}{264}$.

(13.) $77+640=\frac{717}{1760}$l$=8$s $1\frac{3}{4}$d $\frac{1}{11}$.

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* *Compound fractions muſt be reduced to ſimple ones by Prob. 4. before they are reduced to a common denominator.*

† *In the examples which follow, the denominator is omitted under the numerators, but is placed under their ſum.*

(14.) $24+400+576=\frac{1000}{64}=\frac{25}{16}=$ 1l 11s 3d.
(15.) $33600+1600+336=\frac{2221}{8400}=$ 3 oz. 3 dwt $10\frac{34}{35}$ gr.
(16.) $900+4000+5376=\frac{10276}{9600}=$ 1l 1s $4\frac{3}{5}$d $\frac{3}{5}$
(17.) $196+6240+10080=\frac{16516}{6720}=$ 2l 9s $1\frac{3}{4}$d $\frac{3}{7}$
(18.) $40+48+32=\frac{15}{8}=$ 1 yard 3 qrs 2 nails.
(19.) $3584+44800+1024000+259840=\frac{1332224}{1433600}=\frac{1301}{1400}$,
then 1l $+\frac{1301}{1400}=$ 1l 18s $7\frac{1}{35}$d.
(20.) $80+16128+336000=\frac{352208}{537600}=$ 13 c. 11 lb. 8 oz. $8\frac{8}{25}$ drs
(21.) $576+80+18=\frac{674}{960}=$ 5 buſh. $2\frac{7}{15}$ pecks.
(22.) 4 days 10 hours 36 minutes. (23.) 103l 6s $7\frac{19}{610}$d.
(24.) 4 cwt 3 qrs 12 lb. 10 oz. $9\frac{5}{7}$ dr.
(25.) $54\frac{1}{8}$ y. $+16\frac{7}{8}$ y. $+37\frac{6}{8}$ y. $+3\frac{4}{8}$ y. $=112\frac{1}{4}$ yards.

Subtraction.

1. $\frac{23}{60}$
2. $\frac{59}{144}$.
3. $\frac{239}{374}$.
4. $\frac{801}{1125}$.
5. $\frac{173}{1512}$
6. $\frac{73}{143}$
7. $1\frac{3}{8}$.
8. $3\frac{11}{12}$.
9. $4\frac{1}{4}$.
10. $14\frac{4}{7}$.
11. $12\frac{5}{8}$
12. $9\frac{3}{40}$
13. 12s $1\frac{1}{2}$d $\frac{10}{11}$
14. 14s $5\frac{1}{2}$d $\frac{6}{7}$.
15. 10s $7\frac{1}{2}$d $\frac{6}{11}$.
16. 2l 3s $5\frac{1}{2}$d $\frac{10}{11}$
17. $108-81=\frac{27}{152}$.
18. $13\frac{5}{8}-7\frac{6}{8}=5\frac{7}{8}$.
19. $1-\frac{31}{70}=\frac{39}{70}$.
20. $\frac{45}{112}=$ 25 g. $2\frac{1}{2}$p.

Multiplication *.

(13.) $\frac{5}{8}\times\frac{17}{18}=\frac{85}{144}\div$ 11s $9\frac{1}{2}$ $\frac{2}{3}$. (14.) 19s $5\frac{3}{4}$d $\frac{5}{77}$.
(15.) 6l $7\frac{1}{33}$s. (16.) 1l 1s $3\frac{5}{7}$d. (17.) 4s $3\frac{3}{4}$d $\frac{1}{7}$.
(18.) 12l 4s $3\frac{3}{4}$d $\frac{19}{35}$.

Diviſion.

(13.) $38\frac{7}{8}\div7\frac{5}{7}=\frac{311}{8}\div\frac{54}{7}=\frac{311}{8}\times\frac{7}{54}=\frac{2177}{432}=$ 5s $0\frac{1}{4}$d $\frac{8}{9}$.
(14.) 16s $9\frac{1}{95}$d. (15.) 13s $4\frac{1}{2}$d $\frac{6}{7}$. (16.) $\frac{18}{121}$.
(17.) $1926\frac{468}{667}$. (18.) 45l 15s $3\frac{7}{55}$d, and 23l 9s $2\frac{1}{4}$d. $\frac{359}{341}$.

Proportion.

(1.) $\frac{3}{5}:\frac{7}{18}::\frac{19}{4}:\frac{5}{3}\times\frac{7}{18}\times\frac{19}{4}=\frac{665}{216}$l $=$ 3l 1s $6\frac{1}{4}$d $\frac{5}{9}$.
(2.) 2l 14s $3\frac{1}{4}$d $\frac{5}{7}$. (3.) 2s $5\frac{1}{2}$d $\frac{5}{12}$. (4.) 8l 5s.
(5.) 6l 16s $8\frac{1}{2}$d $\frac{1}{2}$. (6.) 1l 9s 7d. (7.) 260l 11s $1\frac{1}{4}$d $\frac{1}{3}$.
(8.) 322l. (9.) 1l 17s $1\frac{1}{4}$d $\frac{67}{169}$. (10.) 56 yds $3\frac{17}{125}$ nails

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* *The firſt twelve queſtions here are the reverſe of the firſt twelve in diviſion.*

(11.) 200 ft $5\frac{5}{11}$ in. (12.) 400l 14s $3\frac{1}{4}$d $\frac{5}{7}$.
(13.) 13 m. $19\frac{299}{4084}$ days. (14.) 1 lb. $4\frac{4}{11}$ dwt.
(15.) By the queſtion A. performs $\frac{1}{18}$ of the work in 1 day, B. $\frac{1}{20}$, and C. $\frac{1}{24}$; then $\frac{1}{18}+\frac{1}{20}+\frac{1}{24}=\frac{53}{360}$ = the part of the work done by the whole in 1 day; therefore, 53 : 1 :: 360 : $6\frac{42}{53}$ days.

Exerciſes.

(1.) $23=22\frac{2}{2}$, $34=33\frac{3}{3}$, &c. (2.) $10=9\frac{9}{9}$, $100=99\frac{9}{9}$ &c.
(3.) $967680+80064+1090560=\frac{2138304}{1105920}$ lb. which × $5\frac{7}{12}$l = 27l 10s $10\frac{3}{4}$d $\frac{43}{72}$. (4.) $\frac{157}{420}$. (5.) $18\frac{39}{40}$ g.
(6.) $2\frac{4}{11}$ pks, and $\frac{47}{560}$ pts. (7.) $\frac{250971}{2048}=122\frac{1115}{2048}$ lb.
(8.) $\frac{57}{8}\times\frac{281}{144}\times\frac{11}{150}=\frac{58729}{57600}$ = 1l $4\frac{1}{2}$d $\frac{49}{60}$ (9.) 2100l.
(10.) 75l 11s $1\frac{1}{203}$d. (11.) $78\frac{2}{5}\div4\frac{2}{3}=\frac{392}{5}\div\frac{14}{3}$ = 16l 16s a man's ſhare. (12.) 990l. (13.) 5l 12s 6d.
(14.) 3l 3s. (15.) 6s $10\frac{3}{4}$d $\frac{1}{5}$. (16.) $\frac{2}{55}\times\frac{12}{13}\times\frac{32}{3}\times\frac{11}{12}\times\frac{31}{4}=\frac{5456}{2145}$ = 2l 10s $10\frac{1}{4}$d $\frac{121}{143}$. (17.) $\frac{3}{4}$ y. : $\frac{523}{18}$ y. :: $\frac{67}{18}$ y. : $144\frac{49}{243}$ yds. (18.) $\frac{4}{21}\times\frac{6}{5}\times\frac{13}{1}\times\frac{3}{4}\times\frac{43}{5}=\frac{3354}{175}=19\frac{29}{175}$ yds.
(19.) 12s. (20.) $\frac{1}{2}+\frac{1}{4}$, &c. $=\frac{11}{10}$ = 110 by the queſtion, therefore 11 : 110 :: 10 : 100 number of goats. Next, $\frac{1}{2}+\frac{1}{4}+\frac{1}{5}+\frac{1}{8}$, &c. $=\frac{5}{4}$ = 500 by the queſtion, and laſt ſtep whence 5 : 500 :: 4 : 400 number ſheep. (21.) $2\frac{113}{173}$ h.
(22.) $\frac{1}{25}+\frac{1}{22}=\frac{47}{550}$ and $\frac{1}{8}-\frac{47}{550}=\frac{87}{2200}$ = C's part for 1 day, then 87 : 1 :: 2200 : $25\frac{25}{87}$ days.

Decimal Fractions.

Addition. (1.) 6637.872625. (2.) 104.30009. (2.) 966.609554. (4.) 246.0884. (5.) 105.2592494.

Subtraction. (6.) 35.77, 80.438504, 2.18693, .2978, .215846, 3.627, and .000691.

Multiplication.

1. 50387.0389
2. 59728.5838
3. .0646263
4. .0009282
5. 2.7321
6. 19.54 *
7. 6.19014
8. .633654
9. .000312
10. 18.164
11. .4986
12. .648

Diviſion.

1. .1331
2. .61436
3. 79.347
4. 416.1857
5. 3.157947
6. .003596
7. 3138758
8. 116648.16
9. 111.359
10. 1105.363545
11. 22.93
12. 7.48635

* *When the multiplier is a repeater, it will be moſt accurate to uſe its equivalent vulgar fraction inſtead of it.*

Reduction.

Prob. 1. Example 1. $\frac{1}{8} = 8)1.000(.125$

2. .625
3. .5
4. .25
5. .75
6. .875
7. .333
8. .111 &c.
9. .833
10. .1666
11. .5625
12. .2
13. .0133
14. .00533
15. .6363
16. .7272
17. .44
18. .8181
19. .142857
20. .2727
21. .076923
22. .0101
23. .2037
24. .666
25. .94118

Prob. 2. Example 1. $.5 = \frac{5}{10} = \frac{1}{2}$.
(2.) $\frac{1}{4}$. (3.) $\frac{3}{4}$. (4.) $\frac{1}{8}$. (5.) $\frac{5}{8}$. (6.) $\frac{17}{50}$. (7.) $\frac{3}{8}$.
(8.) $\frac{1}{200}$. (9.) $\frac{39}{500}$.

Examples to the note.

(1.) $\dot{6} = \frac{6}{9} = \frac{2}{3}$, $.\dot{8}\dot{1} = \frac{81}{99} = \frac{9}{11}$, $.09 = \frac{9}{99} = \frac{1}{11}$, $.8\dot{3} = \frac{83-8}{90}$
$= \frac{75}{90} = \frac{5}{6}$ and $.8\dot{1}\dot{2} = \frac{812-8}{990} = \frac{134}{165}$.
(2.) $\frac{8}{33}$. (3.) $\frac{43}{300}$. (4.) $\frac{503}{3300}$. (5.) $\frac{385}{999}$. (6.) $\frac{23}{30}$.
(7.) $\frac{22}{45}$. (8.) $\frac{112}{165}$. (9.) $\frac{413}{999}$. (10.) $\frac{1}{3}$. (11.) $\frac{11}{15}$.
(12.) $\frac{27289}{49950}$.

Con. I. Ex. 1. .3277 (2.) 3.7. (3.) 3.1407
II. (1.) .2349 (2.) .1871 (3.) .1331 (4.) .2311
III. 1. .435
2. .367
3. .478
4. .734
5. .672
6. .890
7. 4.525
8. 3.429
9. 4.335
10. 7.786
11. 2.656
12. 3.834
IV. 1. 8s 11$\frac{1}{2}$d
2. 6s 6d
3. 2l 10s 8d $\frac{3}{4}$
4. 13s 6$\frac{3}{4}$d
5. 18s 1d
6. 16s 4$\frac{1}{4}$d
7. 4l 19s 7$\frac{1}{2}$d
8. 6l 14s 10$\frac{1}{2}$d
9. 4l 19s 11$\frac{1}{2}$d
10. 15s 11$\frac{3}{4}$d
11. 17s 4$\frac{1}{4}$d
12. 17s 5$\frac{3}{4}$d

Intereſt.

1. 16l 4s 10$\frac{1}{4}$d
2. 3l 17s 9$\frac{3}{4}$d $\frac{117}{365}$
3. 3l 7s 4$\frac{1}{4}$d
4. 8l 2s 9$\frac{3}{4}$d
5. 3l 17s 4d
6. 16l 9s 6$\frac{1}{4}$d
7. 32l 5s 6$\frac{1}{4}$d
8. 3l 12s 11$\frac{1}{5}$d
9. 4l 9s
10. 10l 11$\frac{3}{4}$d
11. 5l 7s 8$\frac{1}{2}$d
12. 2l 10s 3d

13. March 12. due 500l×26 days = 13000.
April 7. paid 150
Ballance 350×82 days = 28700.
June 28. paid 200
Ballance 150 ×79 days = 11850
September 15. paid 150
365×20 = 7300)53550(7l 6s 8$\frac{1}{2}$d $\frac{14}{73}$

14. 456× 42=19152
336×101 33936
220× 51 11220
84× 40 3360
73.00) 67668
Anſwer. 9l 5s 4½d

15. 1000×25=25000
700 ×36 25200
466 ×76 35416
236 ×82 19352
7300) 104968
14l 7s 7d

16. 900×58=52200
750 30 22500
480 81 38880
307 39 11973
94 57 5358
37 55 2035
7300)132946
£.18 4 2¾

17. 1000×181=181000
700 95 66500
550 64 35200
330 150 49500
7300)332200
Inter. £.45 10 1½

18. 2000×77 =154000
1650 174 287100
960 81 77760
540 110 59400
7300(578260
Inter. £. 79 4 3¼

20. 250×38=9500
126 20 2520
266 21 5586
36 23 828
376 70 26320
226 23 5198
447 30 13410
63362
4
36500)253448
6l 18s 10½d

19. 210×59=12390
360 38 13680
230 24 5520
470 50 23500
255 24 6120
555 23 12765
388 36 13968
638 24 15312
358 37 13246
238 36 8568
7300(125069
17l 2s 7¾d

	Dr.	Cr.
21. Dr. 120×16 =	1920	
Cr. 200		
Cr. 80×60 =		4800
Dr. 180		
Dr. 100×111 =	11100	
Cr. 60		
Dr. 40×48 =	1920	
Dr. 320		
Dr. 360×21 =	7560	
Cr. 400		
Cr. 40×24 =		960
	22500	5760
	5760	

7300)16740

2l 5s $10\frac{1}{4}$d $\frac{31}{73}$

		Dr.	Cr.
22. 103	×68 =	7004	
221	28	6188	
133	46		6118
267	36	9612	
8	75		600
108	19		2052
242	74	17908	
13	12		156
		40712	8926

4

5)162848

32569.6

8926

7300)23643.6(3l 4s $9\frac{1}{2}$d

		Dr.	Cr.
23. 107	×47 =	5029	
337	13	4381	
63	31		1953
258	26	6708	
38	49	1862	
199	32	6368	
339	4	1356	
159	56	8904	
		7300)34608	1953

4l 10s $6\frac{1}{4}$ due T.M.

		Dr.	Cr.
24. 80	×102 =	8160	
92	16		1472
18	81		1458
116	36		4176
8	17		136
156	32		4992
61	32	1952	
196	41	8036	
		)18148	12234

6s 3d due R.C.

25. 750l bor.
50.753425
800.753425
180 paid
620.753425
38.265622
659.019047
360.paid
299.019047
24.167292
£.323.186339
Or, 323l 3s $8\frac{3}{4}$d

26. 600l bor.
40.767123
640.767123
250 paid
390.767123
25.587217
416.35434
225.paid
191.35434
2.595079
193.949419
175.paid
18.949419
1.194073
£.20.143492

27. 1000l bor.
69.726027
1069.726027
400.paid
669.726027
42.752373
712.4784
350.paid
362.4784
26.763816
£.389.242216
Or, 389l 4s $10\frac{1}{4}$d

Diſcount

1. 102l : 100l :: 350l : 343l 2s $8\frac{3}{4}$d.
2. 96789 f. : 100 :: 216000 f. : 223l 3s $3\frac{3}{4}$d.
3. 2020 ſ. : 100 :: 4250 ſ. : 210l 7s 11d.
4. 100.7534l : .7534l :: 410l : 3l 1s $3\frac{3}{4}$d.
5. 101.09l : 1.09589l :: 150l : 1l 12s $6\frac{1}{4}$d.
6. 101.71l : 1.71233l :: 220l : 3l 14s $\frac{3}{4}$d.
7. 101.0822 : 100 :: 1875 : 1854l 18s 6d.
8. 103.904 : 100 :: 1000 : 962l 8s $6\frac{1}{4}$d.

Equa. of paym. 1. $77\frac{7}{13}$ days. 2. $238\frac{14}{47}$ d. 3. $188\frac{2}{5}$ days.
Comp. intereſt, Ex. 1. 1.05×1.05×1.05×400 = 463.051 amt.
2. 449.945l amount 49.945l int. 3. 243.101l amount.

Partnerſhip.

(1.) $12:\left\{\begin{matrix}3\\4\\5\end{matrix}\right\}::120:\left\{\begin{matrix}30\\40\\50\end{matrix}\right.$ (2.) $106\frac{2}{3}$, 320, $533\frac{1}{3}$.
(3.) A's 27l 17s $5\frac{1}{31}$d, B's 38l 6s 5^{13}d C's 41l 16s 1^{17}d.

4. A's 94l 5s $8\frac{1}{2}$d $\frac{2}{7}$, B's 62l 17s $1\frac{1}{2}$d $\frac{6}{7}$, C's 41l 18s $1\frac{0}{4}$d $\frac{4}{7}$, D's 20l 19s $0\frac{1}{2}$d $\frac{2}{7}$.
5. M's 37l 4s $3\frac{0}{4}$d $\frac{84}{89}$, N's 52l 8s $5\frac{1}{4}$d $\frac{51}{89}$, P's 54l 7s $3\frac{1}{4}$d $\frac{43}{89}$.
6. B's 96l 8s $2\frac{1}{4}$d $\frac{11}{13}$, C's 57l 8s $8\frac{1}{2}$d $\frac{6}{13}$, D's 86l 3s $0\frac{3}{4}$d $\frac{9}{13}$.
7. A's 300l, B's 480l, C's 420l.
8. L's 101 acr. $8\frac{8}{19}$ poles, M's 88 acr. 1 rood $27\frac{7}{19}$ poles, N's 50 acres 2 roods $4\frac{4}{19}$ poles.
9. A's 60l 18s $3\frac{1}{4}$d $\frac{31}{197}$, B's 155l 18s $9\frac{1}{4}$d $\frac{103}{197}$, C's 263l 2s $11\frac{1}{4}$d $\frac{63}{197}$.
10. A's 47l 8s $4\frac{1}{4}$d $\frac{349}{691}$, B's 113l 19s $0\frac{0}{4}$d $\frac{528}{691}$, C's 92l 12s $7\frac{1}{4}$d $\frac{505}{691}$.
11. A's 68l 3s $7\frac{1}{2}$d $\frac{6}{11}$, B's 54l 10s $10\frac{3}{4}$d ^{7}, C's 27l 5s $5\frac{1}{4}$d $\frac{9}{11}$,
12. A's and C's 122l 11s $0\frac{3}{4}$d $\frac{3}{47}$, B's 114l 17s $10\frac{1}{4}$d $\frac{41}{47}$.
13. A's 10l 18s 2d $\frac{2}{11}$, B's 12l 5s 5d ^{5}, C's 6l 16s 4d^{4}.
14. A's continues $4\frac{1}{2}$ months, B's 5 m. C's $2\frac{1}{2}$ months.

Profit and Loſs.

1. 44d : 100 :: 4d : $9\frac{1}{11}$ *per ct.*
2. 15s : 100 :: $1\frac{1}{2}$s : 10 *per ct.*
3. $9\frac{1}{2}$s : 100 : $2\frac{1}{2}$s : $26\frac{6}{19}$
4. 66 : 100 :: 9d : $13\frac{5}{11}$
5. $56\frac{12}{23}$, 11l 15s 1d
6. 12 : 100 :: $2\frac{1}{2}$d : $20\frac{5}{6}$
7. 335l : 65 : 100 : $19\frac{27}{67}$
8. 100 : 44d :: $109\frac{1}{11}$: 4s
9. 100 : 15s :: 90 : 13s 6d
10. 100 : 114d :: $126\frac{6}{19}$: 12s

11. 100 : 66d :: $86\frac{4}{11}$: 4s 9d
12. 100 : $5\frac{3}{4}$d :: $156\frac{12}{23}$: 9d
13. 100 : 4s :: $120\frac{5}{8}$: 4s 10d
14. $109\frac{1}{11}$: 4s :: 100 : 3s 8d
15. 90 : 13s 6d :: 100 : 15s
16. $86\frac{4}{11}$: 57d :: 100 : 5s 6d
17. $156\frac{12}{23}$: 9 :: 100 : $5\frac{3}{4}$d
18. $120\frac{5}{8}$: 58d :: 100 : 4s
19. $126\frac{6}{19}$: 12 :: 100 : 9s 6d
20. 5s : 112 :: 6s : $134\frac{2}{5}$ then
$134\frac{2}{5}$ — 100 = $34\frac{2}{5}$ anſ.
21. 16 : 86 :: 15 : $80\frac{5}{8}$, then
100—$80\frac{5}{8}$ = $19\frac{3}{8}$ anſ.
22. $24\frac{32}{93}$.
23. $\frac{4}{7}$ loſs.

Exerciſes.

1. 17s gain, $6\frac{2}{3}$ *per cent.*
2. 18l 4s 6d, 54 *per cent.*
3. 15s 10d, $5\frac{5}{9}$ *per cent.*
4. 9s $4\frac{1}{2}$d, $\frac{18}{19}$ *per* gal.
5. 28l 19s 10d, $58\frac{1}{3}$ *per cent.*
6. 4s $7\frac{3}{4}$d $\frac{101}{133}$.
7. 1s $\frac{3}{4}$d, $\frac{3}{4}$ *per* lb.
8. 12s, $\frac{22}{35}$ *per cent.*
9. 10s $2\frac{3}{4}$d, $\frac{51}{95}$ *per* gal.
10. $3\frac{3}{4}$ loſs.
11. 10 *per cent.*
12. 474l 5s 8d—413l 4s 8d = 61l 1s gain
13. The barley, rent, and wages make 2285l, 1600 buſhels malt at 2s $11\frac{3}{4}$d (*duty deducted*) amount to $2383\frac{1}{3}$l, therefore 98l 6s 8d gain. $4\frac{416}{13771}$ gain *per cent.*
14. 2440l 16s 4d—2240l 1s = 200l 15s 4d gain.
15. 3618.725l—3510.725l = 108l gain, $3\frac{32139}{421287}$ *per cent.*
16. 3s prime coſt and 960 yards.
17. The preſ. worth of 1l 4d due 4 m. hence is 1l, whence 15l : 5s :: 100 : $33\frac{1}{3}$ *per cent.*
18. 100 : 12 :: 110:13s 4d, and 100:13s 4d :: $102\frac{1}{2}$: 13s 8d.
19. 26l 5s is the amount of 25l for a year alſo 5s 4d *per* lb. is 29l 17s 4d *per* cwt, the preſent worth of which is 28l 18s $\frac{3}{4}$d $\frac{3}{31}$, and therefore 2l 13s $\frac{3}{4}$d $\frac{3}{31}$ gain, $2\frac{106}{217}$ *p. cent.*

Exchange.

Ireland.

1. 108 : 100 :: 972 : 900l
2. 100 : 109 :: 385 : 419l 13s
3. 482l 6s $0\frac{1}{4}$d
4. 746l 17s 6d

America.

1. 140 : 100 :: 672 : 480l
2. 6000l $1\frac{3}{4}$d $\frac{1}{5}$
3. 929l 12s $1\frac{1}{4}$d
4. 11544l 8s

Holland.

1. 100 : 104.75 :: 48750 : 51065.625 guild. = 51065 g. 12 ſt. 8 pen.

2. 102.25:100 :: 7864:7690.9535 g. b.=7690 g. 19 ſt. 11$\frac{1}{5}$ p.
3. 34$\frac{1}{2}$×12 : 1l :: 7846×40:758.067l=758l 1s 4$\frac{16}{69}$d.
4. 1l:438 d.fl. :: 4850l : 212430d, and 40)212430(53107$\frac{1}{2}$g.*
5. 35$\frac{1}{2}$×12 : 1 :: 854×40 : 481l 2s 6$\frac{1}{4}$ $\frac{49}{71}$d.
6. 1l : 435 d. fl.:: 648l : 281880d fl.=1174l 10s flemiſh.
7. 102.75 : 100 :: 7860 : 7649.635 guilders banco, then 422d. fl. : 1l :: 7649.635×40 : 725.083=725l 1s 8d ſter.
8. 1l ſter. : 426d. fl. :: 4050l : 1725300 d.=43132.5 g. then 100:103::43132.5:44426.475 g. cur.=44426 g. 9 ſt. 8 pen.

9. 1s 9$\frac{3}{4}$d $\frac{49}{73}$ 11. 12051l 16s 1$\frac{1}{2}$d fl. 13. 1589l 19s 1$\frac{1}{2}$d
10. 1s 9d nearly 12. 4597l 4s 2$\frac{3}{4}$d $\frac{1}{13}$ſter. 14. 461l 19s 1$\frac{3}{4}$d $\frac{1}{5}$ $\frac{3}{3}$.

Hamburgh.

1. 400 d. : 1l :: 269600×32 : 21568l ſter. 2. 122409 ml.
3. 33$\frac{1}{2}$ ſt. : 2 m.l. :: 8468×20 : 10111 m. lubs
4. 4005 g. 9 ſt. 5. 872l 10s 3d. 6. 6928 ml. 24 fl.
7. 103 : 100 :: 4892 : 4749.514563 guild. banco, 32.75 : 2 :: 4749.5145×20 : 5800.933813 m. l. banco, 100 : 118.5 :: 5800.933813 : 6874.106=6874 m.l. 1 fl. cur.
8. 2995 guild. 4 ſtiv. 9. 30336 marc lubs.

France.

1. 3 liv. : 30$\frac{1}{2}$d :: 480 liv. : 20l 6s 8d 2. 2160 liv.
3. 3 liv. : 28$\frac{1}{2}$ ſt. :: 480 : 16×28$\frac{1}{2}$=228 g. 4. 10210$\frac{40}{71}$ liv.
5. 8964×$\frac{11}{24}$ = 4108.5 g. ban. = 4252.2975 g. cur. = 4252 g. 5 ſt. 15$\frac{1}{5}$ p.
6. 28$\frac{1}{4}$: 3 livres :: 1492116.5 ſt. banco : 158454.85 livres = 158454l 17s
7. 26$\frac{1}{2}$: 3 :: 7488 0 : 84769l 16 ſols.

Portugal.

1. 67.5 : 1 mil. :: 101250d : 1500 milrees.
2. 1420000 rees ÷ 144 = 9861.1 livres.
3. 400 : 48 :: 8460000 : 1015200d. ban.=26141 g. 8 ſt. cur.
4. 4.8×67$\frac{1}{2}$ = 324d = 27s moid. and 6.4×67$\frac{1}{2}$ = 432d = 36s joannes.
5. 480×68d = 136l. 6. 2906×430 = 1249 mil. 58 rees.

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* Or, 212430 ÷ 40 = 53107$\frac{1}{2}$ g. in the ſame manner underſtand the like where it occurs in ſome of the fol. ſolutions.

Spain.

1. 8 r. : 42d :: 1500 r.: 21×375 = 7875d = 32l 16s 3d.
2. 375 : 112 : 306000 marv. : 91392 d. b. = 2284 g. 16 ſt. cur.
3. 12375×80 = 990000 rees = 990 milrees.
4. 41 : 8 :: 20594d : 4018.34 which ×$\frac{32}{17}$ = 7564 r. v. nearly.
5. 108 : 375 :: 37159.2233 ſt. ban. : 3794.8553 r. p.
6. 4260 : 32 r. p. :: 1036244 den. : 7784 r. p. nearly.

Italy.

1. 7860×52 = 408720d = 1703l.
2. 51)483480(9480 ducats.
7. 51 : 6 lires :: 159630d : 18780 lires.
8. 62 : 7$\frac{1}{2}$ :: 31806d : 3847.5 lires = 3847 lires 10 ſols.
9. 1 cr. : 71d :: 1404×$\frac{10}{12}$ = 1170 ſtam. cr. : 346l 2s 6d.
10. 1102×40d = 183l 13s 4d.
11. 5$\frac{3}{4}$ lir. : 108 :: 4878 : 91621.5 ſols = 4581 liv. 1s 6d.
12. 7.5 : 380 :: 5512.5 : 27930 marv. = 8214 r. 24 marv.
13. 1890×92 = 173880d = 4347 guilders.
14. 7$\frac{1}{2}$ lires : 91 :: 3720×$\frac{4}{5}$: 36108.8d. ban. = 41525.12d. cur. = 1297.66 marc lubs current.
15. 66 : 100 :: 8664×$\frac{10}{12}$: 10939$\frac{13}{33}$ ducats.
16. 428 : 7$\frac{1}{2}$ :: 1890×34 : 1126 lires 1 ſol.

Denmark and Norway.

1. 6780×4$\frac{1}{2}$ = 30510 R.   2. 464 ſk.)860584 ſk.(1854l 14s 1$\frac{1}{2}$d
3. 104)25417600(244400 g. banco, which ×$\frac{2}{5}$ = 97760 R. then 100 : 108$\frac{1}{2}$ :: 97760 : 106069 R. 3 m. 9$\frac{3}{5}$ ſk.
4. 109)828400(7600 R.×2$\frac{1}{2}$ = 1900 g. b. = 19570 g. cur.
5. 254 ml. : 100 R. :: 5300 ml. ban.: 2086.614 = 2086 R. 3 m. 10 ſk.
6. 100 R. : 255 :: 6780 R. : 17289 ml. = 20401.02 ml. cur.

Sweden.

1. 40.5 : 1l :: 47790 : 1180l.   2. 55576$\frac{1}{2}$ cop. dol.
3. 12$\frac{1}{2}$×$\frac{3}{4}$: 2$\frac{1}{2}$ g. :: 52269 : 13938 g. 8 ſt.   4. 4200 cop. dol.
5. 12×$\frac{3}{4}$ = 9 : 3 :: 7857 : 2619 ml.   6. 36666 cop. dol.

Polland and Pruſſia.

1. 13$\frac{1}{2}$: 1 flor. :: 138240d : 10240 flor.   2. 449l 19s 11$\frac{1}{4}$d.
3. 6 g. : 305 :: 2780 : 4710 f. 16$\frac{2}{3}$ gr.   4. 2180×$\frac{4}{3}$ = 2906$\frac{2}{3}$ f.

5. 6 g.: 315 :: 89615.75×$\frac{40}{41}$: 4590075 gr. = 153002$\frac{1}{2}$ flor
6. 3 : 312 :: 1387.5 m.l. banco : 144300 gr. = 4810 florins.
7. 306 gr. : 6 g. :: 229500 gr. : 4500 g. ban. = 4725 g. cur.

Ruſſia.

1. 1785×53d = 394l 3s 9d
2. 105 : 3 :: 178500 : 5100 m.l.
3. 364l 13s 10d
4. 6436×$\frac{48}{207}$ = 1492l 8s 1$\frac{1}{4}$d
5. $\left\{\begin{array}{l}\text{108:3 :: 216000:6000 m.l.}\\ \text{399d)192000d(481l 4s }\tfrac{3}{4}\text{d}\end{array}\right.$

6.
$$\begin{array}{r} 1728\\ \underline{50}\\ 200)86400\\ \underline{432\text{ com.}}\\ \underline{312\text{ft.})86832}\\ 409\text{l }11\text{s }8\text{d ſter.}\end{array}$$

7. 377l 4$\frac{1}{2}$d.

Drawing and Remitting.

1. 30d : 1200l :: 32d : 1280l and 1280l—1200 = 80l gain.
2. 110 : 480 :: 106 : 462l 10s 10$\frac{3}{4}$d $\frac{7}{11}$.
3. 106.5 : 960 :: 109 : 982.535 whence 22l 10s 8$\frac{1}{2}$d loſs.
4. 33s 6d : 1000 :: 36s 4d : 1084.577l, whence 84l 11s 6$\frac{1}{2}$d lſs
5. 406d : 6000 :: 440d : 6502.463, 502l 9s 3$\frac{1}{4}$d loſs, 8.374 *per cent.*
6. 105 : 780.75 :: 108 : 803l 1$\frac{2}{7}$s.
7. 410)1752000(4273.17l, 273l 3s 5d gain, 6.829 *per cent.*
8. 40 : 750l :: 45d : 843l 15s, 93l 15s gain, 12$\frac{1}{2}$ *per cent.*

Arbitration.

1. $\begin{array}{r} 5=6\\ 4=7\\ 5=5\\ 1176=?\end{array}$ that is $\frac{1176\times4\times5}{7+6}=\frac{1760}{21}=560$ yds En. and $\begin{array}{r} 6=5\\ 7=4\\ 5=5\\ 100=?\end{array}$

that is $\frac{100\times7\times6}{4\times5}=210$ yds Ham.

2. $\frac{416\times64}{68}=32$s 7$\frac{9}{17}$d.

4. $\frac{240\times65\times52}{426\times32}=29\frac{107}{142}$d.

3. $\frac{414\times66}{64}=35$s 6$\frac{15}{16}$d.

5. $\frac{240\times50\times1000}{410\times400}=73\frac{7}{41}$d.

Exerciſes.

1. 1804l cur. 3. 2532l 15s. 5. 32s flem. 7. 1320l.
2. 131l 6s 6d 4. 1778l 1s 11$\frac{1}{2}$d 6. 82l 13s 4d 8. 3364.4 g.

9. 112 : 100 :: 7909.5 : 7062.053 R. banco+17.655 com. = 7079.708 R. 211 ſtivers : 1l :: 7079.708×50 : 1677l 13s 1½d anſ.

10. 240 : 397d fl. :: 259744 : 429659.86 pence flemiſh. 8128d fl. : 100 R. :: 429659.86+1074.15 com. : 5299.38 R. Daniſh.

11. 1000×1½ = 75l directly. 2 : 32.5 :: 1000 : 16250, and 16250 ÷ 215 = 75l 11s 7½d, by Holland.

12. 1500×14.9 = 22350, and 22350 — 670.5 = 21679.5 piaſters, 21679.5 × 53¼d = 1154433.375d = 4810l 2s 9¼d ½ ſterling.

13. 45000l—44117l 12s 11½d = 882l 7s ½d gain.

14. 8760×56d = 2044l directly. 8760×48.5 = 424860 ſtiv. which ÷ 215 = 1976l 1s 10¼d on Holl. Next, 106 : 3 :: 876000 : 24792.4528, which × $\frac{32}{402}$ = 1973l 10s 6¾d on Hamburgh.

15. 1500×27½ = 13750 ſtiv. which ÷ 220 ſtiv. = 62l 10s.

16. 4.75)8400(1768l 8s 5d dir. and 108.5)840000(7741.935 + 38.709 com. = 7780.644 which divided by 431 = 1805l 5s 1d on Hol.

17. 4148l 2s 11½d. 18. 4104—3971.76 = 132.24 crowns gained.

19. 7896×22⅝ = 744l 7s 3d. 102)789600(7741.176 g. b. + 38.705 com. = 7779.881 g. = 155597.62 ſtiv. then 215)155597.62(723.71+7.237 com.=730l 18s 11½d, then 744l 7s 3d—730l 18s 11½d = 13l 8s 3½d gain.

20. 117l 3s ½d on London, 115l 14s 8¼d on Holland.

21. 4800×3½s = 840l directly, 136.75)480000(3510.0548+17.55027 = 3527.60507 R. and 3527.60507 × 100÷420 839l 18s 1¼d on Holland. Next, 136 : 100 :: 4800 : 3529.41176+17.64705 = 3547.05882 R. which × 8 [8s groſs = rix dol.] and ÷ 34 = 834l 12s ½d by Hamb.

22. 479l 4s 7d by Hol. 495l 9s 8d by Hamb.

23. 213 ſt. : 1l :: 96000 ſt. : 450.704+7.511 int. for 4 m. = 458.215l. Again, 212 ſt. : 1l :: 96480 ſt. : 455.094, 458.215—455.094 = 3.121l = 3l 2s 5¼d gain.

24. Firſt, 1956½ yds at 16½d = 134l 10s 2¼d and 1620 yds at 14d = 94l 10s, the ſum of which is 229l 2¼d. Again, 1955½ yds at 713 rees+1620 yds at 624 rees = 2405.8645 milrees, deduct 84.2052 commiſ. and 1470 m. leaves 851.6593 m. factor due, to which add 1617 milrees, advanced invoice, makes 2468.6593 mil. which at the given

rate of exchange is 704l 11s 11¼d, whence the gain is 475l 11s 9d.

Involution. 1. 279841. 2. 28629151. 3. 1444 inches. 4. 125 feet. 5. 3375 cubes.

Square Root.

```
1.    . .
      576(24 root.
      4
    44)176
       176
       ...
```

```
2.    . . .
      20736(144 root.
      1
    24)107
      4 96
   284)1136
       1136
       ....
```

3. 789
4. 888
5. 1111
6. 70809
7. 9748
8. 123456789
9. 8070405
10. .73
11. 2.4238^{19356}
12. 698.343^{54351}
13. 956.49^{8799}
14. 2480.795+
15. 2.236068—
16. 4.16
17. .91
18. $\frac{7}{12}$, $\frac{9}{11}$, and $\frac{23}{36}$.
19. $.866^{44}$
20. .027
21. 28.0067—
22. 8.266^{6577}
23. 22.0479+
24. .0028
25. 3.316625
26. .000073

Problems.

1. $\sqrt{4\times36}=12$
2. 30.74
3. .8862
4. 21.9089 poles
5. $\sqrt{6400\times3}=138.564$
6. 44.079 poles
7. $\sqrt{3168}=56.3$—
8. $\overline{273-1}\times18=4896$ feet
9. $\sqrt{60\times60\times5}=134.164$
10. 807 breadth
11. $\sqrt{820\times3}=49.6$—
13. 215.4
14. 375—
15. 334.185
16. 203.039 miles
17. 139.08 feet.

Cube Root.

1. 15625(25 root
8
1200)7625
300
25
1525×5=7625
....

2. 21024576(276 root.
8
1200)13024
420
49
1669×7=11683
218700)1341576
4860
36
223596×6=1341576
....

3. 52734375(375
27
25734
23653
2081375
2081375
.....

4. 490982336369(7889
343
147982
131552
16430336
14751872
1678464369
1678464369
. . . .

5. 1371737997260631(
[111111 root.
1
371
331
40737
36631
4106997
3699631
407366260
370329631
37036629631
37036629631

6. 674593540040424851 29(40-
[70809 root.
64
3459354
3419143
40211004042
39763574912
447429130485129
447429130485129

7. 219365327791(6031 r.
216
3365327
3256227
109100791
109100791

8. 344237608531512161929(
343 [7008409 root.
1237608531
1177344512
60264019512
58937840704
1326178808161929
1326178808161929

9. 345 root.
10. 7856 root.
11. 18.93^{531043}
12. $19.862^{334788072}$
13. $1.442^{1557112}$
14. .0045
15. $9.2235^{3044802125}$
16. $41.378^{1117257848}$
17. .020942+
18. $\frac{6}{7}$, $\frac{5}{9}$, $\frac{12}{23}$.
19. 1.912
20. $22\frac{1}{2}$
21. $\sqrt[3]{36\times36\times36\times6\frac{1}{3}}=66.6$ feet.
22. 154.446 feet.
23. 21.8 inches
24. 69.22 in. 57.69 in. 43.26 inch.

Progreſſions.

1. dif. 3 ſum 297
2. 4s and 17l 11s
3. 4s and 995l
4. 25 and 1375
5. 31 and 961
6. 11 and 15s 7d
7. 19 and 627
8. 23 and 7
9. 4s6d firſt & 7l 17s6d laſt
10. 42 and 297
11. 8 and 1572
12. 15l and 2l 7s
13. 7 and 420
14. 384
15. 1215
16. 8l 10s 8d
17. 10l 18s $8\frac{2}{5}$d
18. 3280
19. 4095l 15s

Alligation.

1. 9d. 2. 8s. 3. 7s 9d. 4. 5s $9\frac{1}{4}$d $\frac{5}{7}$. 5. 4s $9\frac{1}{5}$d.

$$6.\ 36\left\{\begin{array}{c|c}30 & 4\\ 40 & 6\end{array}\right.$$
That is, 4 or rather 2 at 30d, and 6 or 3 at 40d; or any numbers in the propor. of 2 to 3.

7. 1, or any equal number of each.
8. 6 lb. at 9d and 1 of each of the reſt.
9. 1 lb. at 4d, 5d, 6d, and ſix at eightpence.
10. 9 gallons at 4s and 7s, and 3 gallons at 6s and 5s.
11. 10 lb. at 4s and 6s, and 20 at 9s.
12. 18 gallons at 4s and 7s, and 6 g. at 6s.
13. 18 b. at 7 and 10s, and 6 at 9s.
14. 12 gallons at 5s, 24 gal. at 5s 6d, and 6 g. at 6s.

Poſition.

1. Suppoſe 12 to be the number, then $12+\frac{12}{2}+\frac{12}{3}+\frac{12}{4}=12+6+4+3=25$ the reſult. Then 25 : 125 :: 12 : 60. Anſ. Or, ſuppoſe the number to be 1, then $1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}=\frac{25}{12}$ the reſult. Then $\frac{25}{12}$: 125 :: 1 : 60. Anſ. as before.

2. 36l. 3. 36 years. 4. 60. 5. 60 p. 80 ap. 48 pl. 64 ch.

5. Firſt, Suppoſe the number to be 0, then $0\times2+16=16$, but ſhould be 56, therefore the error is 40 too ſmall. Again, Suppoſe the number to be 1, then $1\times2+16=18$, and the error is 38 too ſmall; therefore $1\times40=40$, and $0\times38=0$, then $(40-0=)\ 40\div(40-38=)2=20$. Anſ.

7. $11\frac{1}{13}$l A's, $11\frac{5}{13}$l B's, $13\frac{7}{13}$l C's. 8. 15. 9. 35 gal. at 8s, and 25 gal. at 10s. 10. 72 crowns. 11. 12 beggars.

Duodecimals.

Ex. 1. 48 6.	Or, $4=\frac{1}{3}$ 48 6.	Or, 582 in.	Or, $48\frac{1}{2}\times3\frac{1}{3}$.
3 4	3 4	40 in.	$=\frac{97}{2}\times\frac{13}{3}$.
145 6	145 6	12)23280	$=\frac{970}{6}=161\frac{2}{3}$
16 2	16 2	12)1940	=161ft8in.
161 8	161 8	161 8	

1.
2. 540 feet 4 inch. 6 p.
3. 4341 ft 7 in. 7 p.
4. 966 ft 11 inches
5. 8617 ft 4 parts
6. 1279 ft 8 inches 3 p.
7. 5370 ft 6 in. 11 p. 4 th.
8. 444 ft 5 in. 10 p. 6 th.
9. 392 ft 10 in. 2 p. 2 th.
10. 671 ft 9 in. 5 p. 1 th.
11. 1036 ft 10 p. 8 th.
12. 819 ft 9 in. 5 p. 2 th.
13. 1048 ft 7 in. 1 th.
14. 606 ft 10 in. 7 p. 6 th.
15. 557 ft 3 in. 6 p. 4 th.
16. 881 ft 7 in. 9 th. 9 f.
17. 249 ft 9 in. 5 th. 4 f.
18. 4014 ft 7 in. 1 p. 8 th. 8 f.
19. 2960 ft 9 in. 4 p. 1 th. 4 f.
20. 4339 ft 4 in. 7 p. 4 th.
21. 2463 ft 4 in. 3 p. 10 th. 8 f.
22. 5414 ft 9 in. 9 p. 9 th. 9 f.
23. 150 ft 2 in. 1 p.
24. 1182 ft 2 in. 8 p.
25. 3984 ft 10 in. 6 p.
26. 37 ft 6 p. 2 th.
27. 414 ft 10 in. 1 p.
28. 4247 ft 4 in. 1 p. 6 th.
29. 827 ft 1 in. 2 p.
30. 41 ft 1 in. 6 p.
31. 78960 gallons
32. 517440 gallons
33. 181 ft 6 in. 3 th.
34. 302 ft 10 in. 2 p.
35. 201 ft 7 in. 4 p.
36. 288 ft 7 in. 5 p.
37. 35:5:10:11:3:7:6.

Miſcellaneous Queſtions.

1. 252408021 5s 4d
2. { 88109683200000 her.
   { 108110040736$\frac{32}{163}$ caſks
3. 1s 1$\frac{1}{2}$d ſhare 4th claſs
4. 62l 14s $\frac{1}{4}$d
5. 11l 6s 3$\frac{1}{4}$d gain
6. 74l 7s 2$\frac{1}{2}$d
7. { 7604$\frac{1}{6}$ acr. families
   { 1520833$\frac{1}{3}$ ac. Britain
8. 92l 15s 8$\frac{1}{4}$d $\frac{3}{5}$
9. 500 yds 17s 8d ſel.price
10. { 23 13 5$\frac{3}{4}$ $\frac{1583}{2471}$
    { 35 4 2 $\frac{50}{2471}$
    { 41 2 4 $\frac{172}{2471}$
11. 3s 2$\frac{1}{4}$d $\frac{21}{43}$ *per* lb.
12. 14$\frac{177}{184}$ gallons
13. 30l 4s 10$\frac{1}{2}$d at 5 *p.cent.* in.
14. 2005$\frac{1}{3}$ lb. cotton
15. 8s 8$\frac{1}{2}$d $\frac{3}{5}$ *per* gallon
16. A. has the advan. by $\frac{5}{11}$d
17. D. by $\frac{2}{3}$d and gets 985$\frac{3}{5}$ y.
18. 1l 6s 7$\frac{1}{2}$d gain by keeping it
19. 7s 9$\frac{11}{23}$d
20. 2l 5s
21. 151l 13s $\frac{1}{4}$d
22. 4 cwt 2 qrs 12$\frac{1}{30}$ lb. at 15d
23. { 7s 1$\frac{3}{4}$d $\frac{5}{372}$ rum
    { 8s 3$\frac{3}{4}$d $\frac{5}{372}$ brandy
24. 1l 6s 8$\frac{1}{3}$d *per* qr
25. Whole may be continued 3$\frac{3}{5}$ months, and if continued to the end of the year due 126l 15s
26. 43l 3s 9$\frac{3}{4}$d gain
27. 4 months 21 days
28. 10l 2s $\frac{1}{4}$d $\frac{199}{308}$
29. 669l 6s captain's ſhare
    492l 2s firſt mate's, &c.
    388l 10s ſecond mate's
    97l 2s 6d a ſailor's
    66l 12s a marine's
30. 14682l 10s 6d
31. Eldeſt 460l, ſecond 320l, youngeſt 180l, wife's ſhare 240l
32. *1ſt*, 115l 12s 6d
    2d, 192l 14s 2d
    3d, 269l 15s 10d
    4th, 346l 17s 6d
    5th, 423l 19s 2d
    6th, 501l 0s 10d
33. A's 8s 2$\frac{2}{11}$d
    B's 5s 5$\frac{5}{11}$d
    C's 4s 1$\frac{1}{11}$d
    D's 3s 3$\frac{3}{4}$d
34. E's 440l, F's 880l
35. 21 min. 40 ſeconds
36. 170l 13s 11d
37. 3417l 4s 9d
38. 1l 8s 10d
39. 237l 19s 3d
40. { 115l 17s 8$\frac{1}{2}$d directly,
    { 115l 14s 1$\frac{3}{4}$d by Amſterdam, 114l 14s 1$\frac{3}{4}$d
    { by France
41. 566l 13s 4d directly, 572l 13s 10$\frac{3}{4}$d by Hol. 560l 18s 3d by Paris
42. 4l 13s 10$\frac{1}{2}$d $\frac{8}{33}$d *per* bar.
43. 10s each
44. 6640 families
45. 403 ft 8 in. 7 p.
46. 163 feet 7 inches 6 p.
47. 65 ft 11 in. 2 th. 3 four.
48. 40 ft 8 in. 4 p. 11 th. 3 f.
49. 15 ft 1 in. 9 p. 10 th. 1 f. 6 f.
50. 61 ft 8 in. 9 p. 3 thirds
51. 119 ft 2 in. 4 p. 9 f.
52. 84 yds 3 ft 4 inches

53. 133 yds 1 ft 8 inches
54. 920 ft 3 p.
55. 103$\frac{9}{10}$ ſqrs, 238l 19s 5d
56. 155 yds 3 ft 2 in. 12l 18s 11d
57. 34 yds
58. 391.916 yds, 4l 17s 11$\frac{3}{4}$d
278.486 yds 9l 5s 7$\frac{3}{4}$d
59. 1$\frac{2}{3}$ roods
60. 7$\frac{1}{2}$ roods, 12l
61. 3 roods, 4l 10s
62. 248 yds 8 feet
63. 339 yds 1 ft 1 in. 8 p.
64. 49 feet 6 inches
65. 567 feet 4 inches
66. 29260 yds, 792l 9s 2d
67. 184 ft 3 in. 7l 9s 8$\frac{1}{4}$d $\frac{3}{4}$
68. 42 deals
69. 90$\frac{7}{90}$ deals
70. 108 yds
71. 415$\frac{5}{9}$ yds, 25l 19s 5$\frac{1}{3}$d
72. 31640$\frac{5}{8}$ lb. weight of the air on a man's body, and 116990861625000000000 lb weight of the atmoſphere.
73. 3192617771643354838722.0125 lb. weight of water in the ſea. 92988865498064-51613.2625 lb. ſalt
77. 12 inch. 16 in. 20 in. &c.
78. 175.4587 lb.
79. 1302$\frac{3}{4}$ feet
80. 6 ſeconds 6 th. nearly
81. Mercury 589$\frac{593}{1024}$ degrees of light, heat, &c. Venus 173$\frac{1516}{3481}$, earth 92$\frac{13}{729}$, mars 39$\frac{13698}{15129}$, jupiter 3$\frac{64401}{179776}$, and ſaturn 1 degree.

THE END.

ERRATA.

Page 12 Line 18 *for* gal. *read* hhd.
—— 17 —— 29 *for* 38l 18s 10s *read* 38l 18s 10d.
—— 22 —— 11 *for* 3 feet *read* 2 feet.
—— 36 —— laſt *for* 25s 10s *read* 25s 10d.
—— 45 —— laſt *for* $\frac{4}{5}$ hhd *read* $\frac{4}{5}$ runlet.
—— 50 —— 4 *for* $\dot{8}12$ *read* $8\dot{1}2$.
—— 91 —— 5 *for* 185l 5s 5d *read* 185l 15s 5d.
—— 92 —— 37 *for* 3000 lb. *read* 300 lb.
—— 96 —— 2 *for* d *read* D.

ADDENDA.

Specimen of arrangement of queſtion 21.

Simple Addition.

	From Edinburgh			
To Perth	41 miles	From Perth		
To Brechin	83 miles	42 miles	From Brechin	
To Aberdeen	122 miles	81 miles	39 miles	from Aber.
To Banff	166 miles	125 miles	83 miles	44 miles.

Of queſtion 8.—*Compound Subtraction.*

£.357	18	$10\frac{1}{2}$	—	£.249	19	$11\frac{1}{4}$	=	£.107	18	$10\frac{3}{4}$	due to A.
287	18	0	—	198	18	11	=	88	18	1	due to B.
487	19	0	—	298	13	$8\frac{3}{4}$	=	189	5	$3\frac{1}{4}$	due to C.
78	17	9	—	39	18	11	=	38	18	$9\frac{1}{2}$	due to D.
59	13	6	—	50	15	8	=	8	17	10	due to E.
1272	7	$1\frac{1}{2}$	—	838	8	3	=	433	18	$10\frac{1}{2}$	total.

Solution of queſtion 6. in Arbitration of Exchange; omitted, by accident, in its proper place.

30 pence = 1 crown
1 ſtam. cr. = 65 pence
140 ducats = 100 ſtamped crowns
100 piaſtres = 100 ducats
88 pen.groſs = 1 piaſtre
9100 crowns = how many pence groſs

$\frac{30\times140\times100\times88\times9100}{65\times100\times100}$ by abreviation $= 6\times140\times88\times7 =$ 517440 pence = 12936 guilders.

Next, 54 pence : 1 crown :: 517440 pence : $9582\frac{2}{9}$ crowns.

—— of queſtion 78. Miſcellaneous queſtions.

Firſt, $\frac{231\times63\times62\frac{1}{2}}{1728} = \frac{909562\frac{1}{2}}{1728} =$ lb. weight in a hhd = w.

Then the diameter of the wheel being = 48 in. the radius = 24 inches = D and 8 inches = d, therefore p = $\frac{909562\frac{1}{2}}{1728} \times \frac{8}{24} = \frac{909562\frac{1}{2}}{1728\times3} = 175.45$ lb.

MVSEVM
BRITAN
NICVM